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Digital Proficiency Levels for the Brigade and Battalion Battle Staff

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14. ABSTRACT *(Maximum 200 words)*:

This report results from ongoing work to develop a digital proficiency measurement architecture that includes the battle staff equipped with the Army Tactical Command and Control System (ATCCS). The report first examines primary dimensions of ATCCS-enabled performance, including major system capabilities, high-payoff user skills and tasks, and network management skills. It then explores how ATCCS exploitation contributes to critical staff functions, with an emphasis on integration across Battlefield Operating Systems (BOSs). The discussion includes findings on brigade versus battalion differences and digital versus analog staff processes. A family of proficiency level matrixes is presented for six major staff sections. Finally, the report discusses implications of the findings for digital proficiency measurement and after action review (AAR) procedures. Altogether the findings point to high-payoff proficiency targets, paving the way for ATCCS exploitation guidelines and analysis of measurement and AAR requirements for the Future Force. The report includes recommendations for harnessing the knowledge products.

15. SUBJECT TERMS

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Battle Staff Proficiency	Digital User Skills	Digital TOC	BOS Integration

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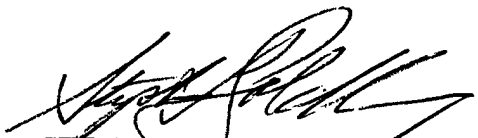
FOREWORD

The Simulator Systems Research Unit (SSRU) of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) investigates training and performance assessment needs of the digitized force. Information age warfare challenges tactical staffs to exploit the powerful capabilities of advanced digital systems. In training to achieve digital proficiency, staffs and their leaders need tools that help them focus on systems-enabled skills contributing significantly to tactical performance. The SSRU assists III Corps' Battle Command Training Directorate and the Program Executive Office for Simulation, Training and Instrumentation (PEO-STRI) by developing performance measurement methods and tools for exploiting digital capabilities.

The research described in this report explored critical proficiency measurement dimensions of the Army Tactical Command and Control System (ATCCS), the family of Force XXI tools supporting the digitized battle staff. The report describes building-block aspects of ATCCS-enabled performance, critical staff processes leveraging ATCCS capabilities, and low-to-high proficiency criteria for major staff sections. The findings feed efforts to extend ARI's digital skills proficiency measurement architecture, enhance performance feedback capabilities, and analyze measurement and feedback requirements of the future force. A companion report (in preparation) will present exploitation guidelines that focus on battle staff integration, including Future Force implications and recommendations for a comprehensive after action review system.

Training developers and researchers can use the findings to focus training packages and tools on high-payoff proficiency targets. For unit leaders and trainers, the well-grounded proficiency criteria can help enhance the training programs of ATCCS-enabled staffs—and ultimately their combat effectiveness.

The results of this work were briefed to III Corps' Battle Command Training Directorate at Fort Hood, Texas (July 9 & November 5, 2003), TRADOC Battle Command Training and Integration Division (November 5, 2003), TRADOC HQ representatives (February 13, 2004), and BG Livsey and Combined Arms Center- Training Collective Training Directorate (February 20, 2004).



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DIGITAL PROFICIENCY LEVELS FOR THE BRIGADE AND BATTALION BATTLE STAFF

EXECUTIVE SUMMARY

Research Requirement:

Equipped with information age warfighting technologies, 21st Century warfighters need training that enables them to exploit advanced digital capabilities. To realize the full benefits of powerful systems, training must focus on high-priority digital tasks and skills. Essential training enablers include criteria and procedures for measuring task and skill proficiency. For the battle staff, the Army Tactical Command and Control System (ATCCS) provides network-centric command and control capabilities. The Army has yet to establish ATCCS-based proficiency measurement standards and criteria for the digitized battle staff. The main goal of the research behind this report was to explore critical proficiency measurement dimensions of ATCCS-enabled performance.

Procedure:

The research team capitalized on the experience of the 1st Cavalry Division, the Army's second digitized division. Subject matter experts (SMEs) interviewed leaders and Soldiers from the 1st and 2nd Brigade Combat Teams and the 4th Aviation Brigade of the division, and they also observed training exercises conducted by those units. In addition, the investigators reviewed ATCCS documentation and training materials to examine the basic capabilities of the system of systems. The team analyzed the results to identify critical user skills and tasks, and to describe staff processes exploiting ATCCS capabilities. They further applied the results, along with the expertise resident within the team, to characterize digital proficiency levels for the major staff sections. Finally they analyzed the implications for measuring digital proficiency and focusing after action reviews.

Findings:

Nearly four dozen high-priority ATCCS capabilities were identified in the areas of digital basics, battlefield visualization, tactical information management and exchange, BOS-specific activities, mission planning and preparation, and mission execution. Further analysis yielded four high-priority user skills, each embracing as many as a dozen specific ATCCS-driven tasks. Three major network management skills were identified, along with critical questions regarding network status.

Exploitation of ATCCS capabilities contributes directly to the performance of critical staff functions, especially BOS integration. In the ATCCS environment, BOS integration processes include sharing information, innovative collaboration, synchronization of activities, cross-BOS review of staff products, integration of multi-BOS inputs into unified products, and multi-BOS rehearsals. The discussion includes consideration of two key variables—echelon

differences and digital versus analog processes. Finally, a set of proficiency level matrixes is presented for six major battle staff sections.

Utilization of findings:

The findings contribute to a systematic digital measurement architecture by illuminating high-payoff proficiency targets for ATCCS users and operators. They are immediately useful to digital leaders, trainers and evaluators collaborating to enhance the combat effectiveness of Force XXI and Stryker battle staffs. The results pave the way for creating tools to facilitate exploitation of ATCCS capabilities. The ultimate benefits can better focus unit training efforts and optimize the warfighting impact of digital training programs.

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INTRODUCTION

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducts ongoing research on the training needs of the digitally-equipped force. In the latest project—*Digital Operations Feedback Tools (*DOFT*)*—ARI's Simulator Systems Research Unit (SSRU) explored the performance measurement dimensions of the Army Tactical Command and Control System (ATCCS), the system of systems supporting the digitized battle staff. The project addressed the need for digital proficiency measurement criteria and procedures. In the ATCCS-enabled tactical operations center (TOC), training must focus on exploiting high-payoff digital capabilities. As the Army's vanguard units gain expertise with digital operations, there is a need to capture their TOC operating procedures and translate them into measurable proficiency targets. Lacking published proficiency targets, leaders and trainers face challenges in focusing training efforts on high-priority ATCCS capabilities. The current research establishes a starting point for measuring digital battle staff proficiency, with critical linkage to combat effectiveness.

This report presents the DOFT project's findings regarding digital staff proficiency levels and the implications for performance measurement and feedback. It is intended as a resource for unit leaders and trainers determined to optimize the digital training experience. The report also provides valuable information for training developers and researchers working to create or improve realistic digital training programs. A companion report (Leibrecht, Lockaby, Perrault, & Meliza, in preparation) will present exploitation guidelines that focus on battle staff integration, including Future Force implications and recommendations for a comprehensive after action review (AAR) system.

Special acronyms abound in the world of digital operations. Accordingly, the reader will find in Appendix C a comprehensive list of acronyms used in this report.

Background

Throughout the battlefields of the 21st century, digitally equipped forces will rely heavily on advanced information technologies to acquire, exchange, and exploit timely information (e.g., U.S. Joint Forces Command, 2002; U.S. Department of the Army, 2001). The U.S. Army is in the midst of fielding the Army Battle Command System (ABCS), a family of digital command, control, communications, computers, and intelligence (C4I) systems offering advanced information-based capabilities. The ABCS family includes the ATCCS as the C4I suite for TOCs. It also includes the Force XXI Battle Command Brigade and Below (FBCB2) as the workhorse tool for maneuver units and platforms. Table 1 summarizes the principal ATCCS components and their operational focus.

The Army has embarked on an ambitious program to develop and field the next generation of C4I systems. Known as the Future Combat Systems (FCS), the knowledge-based family of technologies will equip the Future Force with adaptively intelligent tools, including

robotic systems, for achieving battlefield dominance in a full-spectrum operational environment. The Army faces novel challenges in developing innovative training and measurement methods for exploiting the warfighting advantages of the FCS.

Table 1

Principal Components of the Army Tactical Command and Control System (Brigade and Below)

Component	Role
Maneuver Control System (MCS)	Command and control of maneuver elements; primary source of the Blue picture; chief tool for collaborative planning and data fusion
All Source Analysis System (ASAS)	Planning and control of intelligence activities; primary source of the Red picture, including details on enemy status and capabilities
Advanced Field Artillery Tactical Data System (AFATDS)	Planning and control of indirect fires, including close air support and naval gunfire; primary source of the Fire Support picture
Air and Missile Defense Work Station (AMDWS)	Planning and control of air defense missions; depiction of aircraft, UAV and missile tracks; primary source of the Air Defense picture
Forward Area Air Defense Command (FAAD)	Receives and processes internal and external air track data providing target data to SHORAD weapons.
Combat Service Support Control System (CSSCS)	Planning and control of maneuver sustainment operations; primary source of the Logistics picture, including supply status of each unit

The current and future digital C4I systems promise to improve a unit's warfighting proficiency. Through robust information age capabilities, the powerful tools enable leaders to (a) make better-informed and more timely decisions, (b) collaboratively plan, wargame and refine courses of action, and (c) rapidly change plans in response to new information. True exploitation of C4I systems is expected to produce faster decision cycles, better targeting, and greater control over the tactical situation. When units are well trained, digital systems can reduce fratricide, help friendly forces select where and when to make contact with the enemy, and facilitate economy of force (Dudley et al., 2002). Effective combat performance will depend heavily on realistic training to enable battle staffs to fully realize the benefits of digital capabilities. Such training requires valid tools for measuring the proficiency of digital tasks and skills.

A series of ARI projects has investigated the performance measurement challenges posed by digitization. Barnett, Meliza, and McCluskey (2001) examined how effective use of digital systems can address performance problems encountered at maneuver Combat Training Centers (CTCs). Meliza, Lockaby, and Leibrecht (2003) identified indicators of digital skills proficiency and described a framework for differentiating and ordering levels of performance. Dudley et al. (2001) described changes in behaviors and knowledge as 4ID units adapted to digital systems, and Dudley et al. (2002) detailed the role of digital systems in accomplishing critical combat tasks at brigade and battalion levels. Leibrecht, Lockaby, and Meliza (2003a) examined FBCB2 capabilities, user skills and tasks, and variables influencing digital performance. The same team developed FBCB2 exploitation tools to help leaders and trainers optimize digital training exercises (Leibrecht et al., 2003b). In the battle staff arena Felton, Schaab, and Dressel (2003) inventoried ABCS digital tasks from a mission training plan perspective, and they noted that most staff supervisors (noncommissioned officers) say they need a high level of digital competence and system integration training. Schaab, and Dressel (2003)

found that soldiers want additional training on how to integrate their systems to support their missions. Collectively, the ARI findings establish a basic digital proficiency measurement architecture, with a focus on FBCB2. An important step is to extend the architecture to the ATCCS environment of the digitized TOC, emphasizing of activities across digital systems.

The current research effort addressed the gap in digital proficiency measurement capabilities for training battle staffs of the future. The project set out to characterize digital staff operations and establish meaningful proficiency targets. The ultimate goal was to shape a systematic measurement architecture capable of enhancing training and feedback methods for high-performing battle staffs.

Problem Definition

The ATCCS system of systems provides robust capabilities for data acquisition and fusion, battlefield visualization, information analysis and sharing, collaborative planning, task organization, preparation and dissemination of tactical products, command and control, decision aiding, reporting, targeting, battletracking, and force status tracking. Many of the digital capabilities contribute substantively to combat effectiveness, warranting special attention because of their high payoff (see Leibrecht et al., 2003a). Some of the high-payoff capabilities are not exploited due to lack of training, experience, knowledge, or other reasons. Previous efforts addressing high-payoff proficiency targets have focused on FBCB2-enabled maneuver units (Leibrecht et al., 2003a, 2003b). Comparable knowledge is lacking for the ATCCS-enabled battle staff.

Battle staffs are organized in groups usually known as sections or teams (Table 2). These functional elements loosely follow the structure of the battlefield operating systems, or BOSs (U.S. Department of the Army, 1997). As keys to directing combat operations, the seven BOSs are: maneuver, intelligence, fire support, air defense, mobility/countermobility/survivability, combat service support, and command and control. The allocation of BOS-based functions among separate (but interrelated) staff elements (see Table 2) poses a challenge for battle staffs working to synchronize combat activities. As a result, there has arisen an emphasis on BOS integration among staff teams (e.g., U.S. Department of the Army, 2002). The five ATCCS components listed in Table 1—MCS, ASAS, AFATDS, AMDWS, and CSSCS—serve as the principal tools for BOS integration. The operating procedures for digitally-enabled battle staffs, including BOS integration, are relatively undocumented.

To reap the benefits promised by the ATCCS systems, battle staffs must develop effective digital skills. Combat performance of the future force will depend greatly on realistic training that enables staff members to fully exploit the advantages of digital capabilities. Among other things, standards for training and evaluating digital skills must be developed. Trainers need criteria and procedures by which to measure digital proficiency. In the absence of published digital procedures, units have relied on practical experience and on-the-job training to acquire digital skills. As experience grows, digital capabilities that serve as notable combat multipliers give rise to high-payoff skills that bridge the gap from situational awareness to situational understanding (Dudley et al., 2001). Measurable proficiency targets must be defined for the high-payoff skills in order to foster digital competence. Command emphasis on digital

competence, along with a suitable measurement architecture, is essential if units are to fully realize and apply the advantages of the ATCCS capabilities.

Table 2

Typical Battle Staff Organization for Brigade and Battalion Echelons

Section/Element	Primary BOS Alignment
• S1, Personnel Section	Combat Service Support
• S2, Military Intelligence Section	Intelligence
• S3, Operations and Plans Sections	Maneuver, Command and Control
• S4, Logistics Section	Combat Service Support
• S5, Civil Affairs Team*	Command and Control
• S6, Signal Section	Command and Control
• Fire Support Element	Fire Support
• Air Defense Section*	Air Defense
• Engineer Section	Mobility/Countermobility/Survivability
• Air Liaison Team	Fire Support, Command and Control
• Chemical Section	Mobility/Countermobility/Survivability

* Brigade echelon only

For leaders to know how well their staffs can perform with ATCCS tools, they need measures of digital proficiency. Leaders depend on timely feedback to gauge how well their units execute high-payoff digital skills. They need to know how well individuals and teams are operating their digital systems and using the available capabilities and information. First must come an understanding of the digital tasks and proficiency indicators needed to exploit the advantages the systems offer on the battlefield. Also essential is an understanding of how to monitor the health of the tactical internet (TI), the connectivity backbone for the ABCS. A fully functioning TI is imperative to assure the accuracy and completeness of the common operational picture (COP) provided by the ABCS. Research is needed to establish indicators of system usage and network health that reveal a battle staff's level of digital proficiency.

At Fort Hood, Texas, III Corps leaders have established digital training facilities in the Battle Command Training Center (BCTC) to support home station training of local digitized divisions. Similarly, I Corps leaders have established the Mission Support Training Facility (MSTF) at Fort Lewis, Washington, to help train the Army's first digitally equipped Stryker Brigade Combat Teams (SBCTs). In both the BCTC and MSTF, trainers and observers routinely confront the challenges of measuring digital proficiency levels, and their ranks are growing across the Army. Trainers supporting battle staff exercises in field and simulation environments need measures and standards for assessing how well staff teams employ digital systems. These standards and the guidance for their application must be carefully structured to avoid overwhelming trainers with observation requirements. An essential goal of this project was to create a tactically grounded foundation for focusing leaders' and trainers' attention on high-payoff measurement targets. A realistic database is needed to define battle staff proficiency targets that will contribute most directly to combat effectiveness.

Earlier findings (Leibrecht et al., 2003a, 2003b) highlight the need for measurement criteria in order to provide adequate feedback to warfighters determined to develop digital skills proficiency. Measurement criteria and guidelines must highlight key proficiency targets to focus training objectives and assessment methods. There is a serious knowledge gap regarding how TOC-based digital systems enhance tactical operations, especially with regard to integrating across BOSs. Battle staff integration is imperative for successful military operations. Additional research is necessary to determine the high priority proficiency targets.

This project addressed the gap in digital proficiency measurement capabilities needed to support battle staffs of the future. Predecessor work (Leibrecht et al., 2003a, 2003b) produced measurement guidelines for the platform-based FBCB2 system. Similar work is needed for TOC-based systems, with a focus on BOS integration.

Technical Objectives

The purpose of this research was to establish high-payoff proficiency benchmarks for the ATCSS-enabled battle staff, with an emphasis on BOS integration. The ultimate goal was to enhance the efficiency and effectiveness of digital training and assessment processes. The following technical objectives drove the research described in this report:

- Identify and describe major capabilities of ATCCS to support battle staff operations.
- Identify high-priority ATCCS user skills and tasks supporting BOS integration.
- Examine digital battle staff processes for brigade and battalion echelons.
- Identify and describe examples of low-to-high digital proficiency levels regarding BOS integration.

METHODS

Overview

The research approach tapped the digitization experience gained in the Army's Force XXI Program at Fort Hood, Texas. Knowledge gathering revolved around then-current leaders of the 1st Cavalry Division (1CD), former leaders of various digital units, contractors supporting digitized units, and BCTC classroom instructors. The Combined Arms Center's Battle Command Training Integration Division (BCTID) support contractors, who had developed numerous products describing digital tasks, were a valuable source of information. BCTID is a U.S. Army Training and Doctrine Command (TRADOC) organization providing digital training guidance to U.S. Army Units. The members of the research team—all with considerable digitization experience—also furnished extensive knowledge and insights regarding ATCCS-enabled battle staff operations.

The intent of the effort was to develop a tactically grounded foundation for subsequent development of guidelines for system exploitation and feedback in the future force. To establish high-payoff proficiency targets for the digital battle staff, the research team implemented the following steps:

- Inventory the major capabilities of the ATCCS family
- Prioritize the ATCCS capabilities in terms of their tactical significance
- Organize the high-priority capabilities into functional categories
- Identify user skills essential to digital staff operations, emphasizing BOS integration
- Describe meaningful levels of proficiency for major battle staff sections
- Characterize the differences between brigade and battalion digital staff proficiency
- Analyze the implications for measuring proficiency and conducting AARs

Coordination with warfighters helped validate and refine the proficiency targets. In addition, on request the team supported a battalion level digital training exercise by applying preliminary findings regarding ATCCS capabilities and user skills.

Review of Documents

The team reviewed relevant ATCCS documentation (e.g., system user manuals, training course materials, staff digital operating guide) to inventory the functional capabilities and their role in TOC operations. Unit standing operating procedures (SOPs) were also reviewed for description of TOC and battle staff procedures. Where appropriate, the team inspected actual ATCCS systems to verify or supplement the written information.

Basic information about high-payoff digital capabilities was derived from two previous reports from this research program. Dudley et al. (2002) used a variety of digital subject matter experts (SMEs) to describe how a unit might employ digital systems to reduce fratricide and/or gain greater control over contacting the enemy. For example, commanders can use line-of-sight (LOS) tools and COP displays showing the location of enemy forces to predict when and where their unit is likely to make visual contact with the enemy. Leibrecht et al. (2003a) interviewed 4th Infantry Division (Mechanized) leaders to identify FBCB2 capabilities, high-payoff user

skills, and their contributions to combat effectiveness. They identified fifty digital tasks falling under nine high-payoff user skills. Linked to mission essential tasks, the nine skills pointed to valid proficiency targets and provided a basis for focusing observation and assessment efforts. These sources of information helped identify critical ATCCS capabilities to set the stage for measuring battle staff proficiency, and they also provided examples of higher levels of proficiency.

Data Collection and Reduction

Interviews

Interview participants. The research team's lead SME interviewed a sample of brigade leaders from the 1CD (1st and 2nd Brigades [Armored] and 4th Aviation Brigade). The interviews were conducted in the warfighters' own facilities (Fort Hood) and at their convenience. The senior leadership sample consisted of brigade and battalion Executive Officers, S3s, and S2s. The team also interviewed leaders and Soldiers as they completed the Battle Staff Integration Course at the BCTC. These participants included brigade S3s and S2s, Battle Captains, Fire Support Officers, and operators working with MCS, AFATDS, AMDWS and CSSCS. In addition, informal interviews were held with three recently retired digital operations SMEs, all with command/staff experience plus service with the 4ID, and a few retired senior non-commissioned officers (NCOs) having contemporary active duty experience in the 4ID.

Interview procedures. Most of the interviews were conducted in conjunction with scheduled training events. The interview process probed for knowledge of digital operating procedures and their supporting digital skills (see *Interview questions* below). The interview procedures were designed to capture experience and insights of leaders and Soldiers. The intent was to tap into a reflective thought process concerning their digital skills, gather data based on actual experience, and clarify information obtained from other sources.

To structure the interviews, the SME/facilitator used an interview guide containing questions of interest (Appendix A). Each session lasted approximately two hours, whether one-on-one or group interview. For some of the group interviews, questionnaires were used to facilitate concurrent capture of data. A record of each 1CD interview session was prepared from notes made during the session.

Interview questions. Appendix A contains the interview guide used for the majority of the sessions. The queries targeted digital TOC operating practices, designation of digital responsibilities, contributions to tactical performance, operational problems and deficiencies, and ideas for improving digital operations. Specific questions addressed:

- Methods for integrating battle staff elements and activities
- Rules and procedures for managing connectivity, filters, information, files, etc.
- Means for establishing and maintaining the COP
- Use of ATCCS tools or features to accomplish specific tasks (e.g., rehearsals)
- Preparation of planning products such as maneuver plans and orders
- Sources and means for obtaining information
- Communicating and sharing information

- Documentation of staff operating procedures
- Integration of analog with digital staff processes
- Occurrence and resolution of ATCCS employment problems
- Corrective actions taken to recover from system failures
- Monitoring the currency, completeness and evolution of digital products
- Detection and resolution of gaps in digital information
- Capabilities and requirements for performance feedback and AARs

Observations

The research team observed battalion exercises conducted in live and constructive simulation environments, and battle staff integration exercises conducted in the BCTC. The team occasionally provided personnel to serve as observer/controllers (OCs) for training exercises. This provided opportunities to test early inventories of ATCCS capabilities and skills, and to question OCs regarding digital proficiency measurement insights. Frequently the team conducted interviews with unit leaders in conjunction with the exercises, usually following AARs.

The team's SMEs used a guide (see Appendix A) to structure the observation activities. The guide focused the observer's attention on the issues of interest for interviews, plus the following dimensions:

- The impact of employing digital capabilities
- Synchronization of planning products
- Procedures followed for digital rehearsals
- Monitoring and tracking the battle during execution
- Tools and procedures for accomplishing BOS integration
- Application of terrain analysis tools
- Maintaining and restoring the health of the network

Analytical Procedures

The cumulative data contained qualitative information originating from system-related documents, interview records, summaries of observation sessions, and previous projects. Parallel procedures were used for analyzing and integrating the data related to (a) major ATCCS capabilities and (b) digital proficiency levels. Considering the qualitative nature of the data, strictly non-quantitative techniques were used for analysis. The members of the research team liberally applied their own knowledge and judgment, especially where gaps in interview results or available documentation occurred.

Major ATCCS Capabilities

The team integrated data from ATCCS documents, interviews and previous reports to compile a candidate list of ATCCS capabilities. The initial list broke out capabilities by system, and the team then organized the set to produce an inventory of common capabilities with major import for battle staff operations. The team's SMEs next analyzed the interview findings in light of their own knowledge to judge the relative importance of the ATCCS capabilities in terms of

contributions to tactical performance. The multi-step process yielded a refined list of capabilities prioritized against tactical significance.

One member of the team next applied an informal process to sort the ATCCS capabilities into functional categories driven by the tactical environment. The categories developed earlier by Leibrecht et al. (2003a) provided a springboard for this step. The resulting draft was then provided to participating SMEs for their analysis and elaboration. The collective inputs were compiled and team members met to resolve substantive issues. The revised list of capabilities, organized by functional categories, was circulated for review by selected warfighters, and their comments were incorporated to produce a final version of the list.

Digital Proficiency Levels

The development of digital proficiency levels for the battle staff began with an analysis of high-payoff ATCCS user skills. The team translated the ATCCS capabilities into skills playing a substantive role in combat operations, then prioritized the resulting inventory. The SMEs next identified critical staff functions with an emphasis on BOS integration. From this analysis and the list of ATCCS user skills the team derived high-priority performance parameters related to staff proficiency. For each of the resultant parameters, the team next developed descriptors of varying levels of proficiency, and organized them in matrix format to illustrate low-to-high progression of skills. Comments from digital leaders and Soldiers were used to refine the family of proficiency level matrixes. Finally, the team explored the implications of exploiting ATCCS capabilities for measuring digital staff performance and conducting digitally-focused AARs.

FINDINGS AND DISCUSSION

This chapter presents and discusses the project's findings regarding measurable aspects of battle staff proficiency. The findings focus on dimensions that characterize digital operations of brigade and battalion battle staffs in 1CD. Given this project's narrow sample and the dynamic state of digitization, digital staff procedures may differ in other units. Nevertheless, the results set the stage for developing a comprehensive architecture for measuring the digital proficiency of ATCCS-empowered staffs. The following sections organize the presentation:

- Exploiting System Capabilities
- Digital Staff Processes
- Digital Staff Proficiency

Exploiting System Capabilities

ATCCS Capabilities

As a suite of tools for digital battle staffs, ATCCS brings to primary and special staff elements a host of functional capabilities centering on command, control, and communications. The team's analysis plus input from the 1CD warfighters revealed nearly four dozen major capabilities (Table 3) falling in six operational areas:

- Basic features for initiating and maintaining a digital operating environment
- Essential capabilities for supporting robust visualization of the battlefield
- Key functions for managing and exchanging tactical information
- Capabilities playing a major role in BOS-specific activities
- Activities involved in planning and preparing for combat missions
- High-priority staff tools to support mission execution

Table 3

Inventory of Major ATCCS Functional Capabilities

ATCCS Capabilities	MCS	ASAS	AFATDS	AMDWS	CSSCS
Digital Basics					
Establish and maintain proper digital network	x	x	x	x	x
Assign and manage standard file names and folders	x	x	x	x	x
Activate and update alert settings and criteria	x	x	x	x	x
Implement designated responsibilities for data fusion	x	x			
Clear queues, logs and folders of unneeded items	x	x	x	x	x
Perform user-level maintenance and troubleshooting	x	x	x	x	x
Battlefield Visualization					
Establish and maintain the common operational picture	x	x	x	x	x
Tailor the SA picture to meet user needs	x	x	x	x	x
Tailor digital terrain features for current operations	x	x	x	x	x
Post tactical overlays (operations, fire support, obstacles, etc.)	x	x	x	x	x
Relate friendly vs. enemy locations	x	x	x	x	x

ATCCS Capabilities	MCS	ASAS	AFATDS	AMDWS	CSSCS
Tactical Information Management and Exchange					
Locate, obtain and integrate tactically significant information	x	x	x	x	x
Coordinate and integrate tactical products	x	x	x	x	x
Prepare and manage messages, directives and reports	x	x	x	x	x
Disseminate plans, orders, messages, directives, graphics, reports	x	x	x	x	x
Confirm reception of critical messages	x	x	x	x	x
Monitor the accuracy and currency of tactical products	x	x	x	x	x
BOS-Specific Activities					
Conduct intelligence preparation of the battlefield		x			
Plan, direct and monitor ISR activities	x	x			
Plan, direct and monitor fire support activities	x		x		
Plan, direct and monitor air defense activities	x			x	
Plan, direct and monitor mobility/countermobility/survivability activities	x				
Plan, direct and monitor maneuver sustainment activities	x				x
Mission Planning and Preparation					
Prepare and update the estimate of the situation	x	x	x	x	x
Analyze enemy organizations and their capabilities	x	x			
Develop and analyze courses of action	x	x	x	x	x
Analyze tactically significant aspects of terrain	x	x			
Conduct multi-echelon wargaming of courses of action	x	x	x	x	x
Conduct and monitor collaborative planning	x	x	x	x	x
Create, coordinate and revise planning products	x	x	x	x	x
Task organize to meet mission requirements	x	x	x	x	x
Create, coordinate, and update critical information requirements	x	x	x	x	x
Produce WARNOs and FRAGOs	x	x	x	x	x
Produce complete plans and orders, including annexes and matrixes	x	x	x	x	x
Construct, coordinate and update overlays	x	x	x	x	x
Conduct/support digital rehearsals	x	x	x	x	x
Mission Execution					
Track and report CCIR, FFIR, CTIL, etc.	x	x	x	x	x
Exploit ATCCS in identifying high-priority targets		x	x	x	
Use ATCCS to match most effective weapon against specific target			x	x	
Use ATCCS to monitor and control movements	x	x		x	
Leverage ATCCS in maneuver decisions	x	x	x	x	x
Exploit ATCCS in preventing fratricide	x	x	x	x	x
Use ATCCS to integrate maneuver, fire support, and mobility operations	x	x	x	x	
Use ATCCS to integrate maneuver and air defense operations	x		x	x	
Exploit ATCCS in implementing force protection measures	x	x	x	x	x
Exploit ATCCS in tracking the battle, including status of Blue & Red forces	x	x	x	x	x

Note: See Appendix C for translation of acronyms

Nearly all of the ATCCS capabilities listed in Table 3 fall in the user domain (i.e., battle staff officers and NCOs), as opposed to the operator domain. This mainly reflects the project's emphasis on exploiting the power of the sophisticated suite of tools. At the same time, exploiting ATCCS capabilities requires close teamwork between users and operators. An

inexperienced operator can limit the utilization of a particular system, just as an inexperienced user can. Training user-operator teams to exploit system capabilities in performing operational staff functions is an important part of developing digital staff proficiency.

As Table 3 depicts, most of the functional capabilities occur in all five primary ATCCS systems. This apparently reflects the threading of common processes across the various functional areas, which no doubt influenced the design and development of each C4I system. Where capabilities reside only within selected ATCCS systems, it results from BOS-unique functions or from special combat functions involving two or three BOSs working together (e.g., targeting, terrain analysis, integration of maneuver with air defense). Data fusion is an interesting capability found primarily in MCS and ASAS. While it is true that the other ATCCS systems fuse data from multiple sources to a degree, MCS and ASAS possess more robust data fusion capabilities because of the heavy responsibilities in the Maneuver and Intelligence BOSs to merge and integrate tactical information.

The capabilities listed in Table 3 represent those ATCCS features that play a major role in successful tactical operations of a Force XXI brigade. The capabilities apply to both brigade and battalion battle staffs, with the notable exception that AMDWS is available to only the brigade staff. By distilling information from the Army's first two digitized divisions, the inventory provides a reasonable snapshot of the more valuable ATCCS capabilities supporting Force XXI operational requirements. It represents an important step in establishing high-priority digital staff proficiency targets. In the DOFT project, the inventory provided the springboard for identifying high-payoff user digital skills.

User Digital Skills and Tasks

In a key step for defining proficiency measurement targets for digitally-equipped staffs, the team developed a set of high-priority digital skills and tasks for brigade/battalion echelons. They accomplished this by translating the major ATCCS capabilities (from Table 3) into essential user tasks (specific digital actions), consolidating the tasks where appropriate, and organizing the tasks into four skill categories. The final step was to obtain verification by 1CD leaders. Table 4 displays the resulting skills and tasks.

The user skills and tasks listed in Table 4 largely mirror 4ID and 1CD operational mission requirements, not the organization of ATCCS capabilities. Accordingly, the skills should link closely with mission essential tasks as encountered in a Force XXI unit. This important linkage enables the skills/tasks to serve as a defensible foundation for developing digital staff proficiency targets.

In a fundamental sense, two of the user skills are enablers—establish and maintain the COP, and manage digital information. As such, they set the conditions for effective battle staff operations. The other two skills—apply situational understanding (SU) to avoid fratricidal situations and integrate digital battle command functions—encompass key battle staff functions that must occur for successful tactical operations. All of the high-priority user tasks represent composite applications of digital capabilities—each task exploiting multiple ATCCS features to accomplish functional and tactical performance requirements.

Table 4

High-Priority ATCCS User Skills and Tasks

Skills	Tasks
1. Establish and Manage the COP	• Initiate network by bringing up each digital device one at a time • Manage the lower TI, monitor network and systems reporting • Detect and repair network faults (key platforms, networks, systems) • Direct and execute UTR, track systems that do not accept UTR • Perform digital commo check, verify completeness of COP • Tailor COP by designating filter settings and overlays, per Cdr's guidance • Build BOS-specific overlays (CTP), name properly, drop in designated folders • Correlate Red picture and send to TOC server • Set alerts and warnings on each digital device
2. Manage Digital Information	• Create access privileges for shared folders on TOC server • Place shortcuts to frequently used applications on "Classification Banner" • Build shared folders for each staff section • Standardize naming and color conventions for overlays • Create user-tailored grouping of often-used graphics and symbols • Manage overlay build process to enable multiple users working concurrently • Notify staff via free text message of overlays posted to folders • Post graphics/orders to web page as backup • Set up distribution list for frequently used addresses • Assign responsibility for monitoring and reporting critical information • Integrate data from all intelligence and weather sources • Tailor Commander's Tracked Items List and manage LOGSTAT process • Use automated tools to transfer folders and overlays prior to moving TOC
3. Apply SU to Avoid Fratricidal Situations	• Alert subordinate elements when Obstacle overlay is updated • Issue Netcall to all elements when gaps in Blue picture become apparent • Update FSCMs as Recon and other BLUFOR elements move • Monitor location of non-reporting elements (e.g., coalition forces, NG units) • Monitor and update locations of adjacent and supporting units • Apply SU to deny fires • Use digital overlays to deconflict fires, maneuver and aviation • Apply SU in adjusting ADA umbrella
4. Integrate Digital Battle Command Functions	• Employ digital tools to reduce staff planning time and expedite wargaming • Use digital collaborative tools for OPORD brief and collaborative planning • Build Synch Matrix on digital planning system, post and monitor • Post and monitor CCIR, PIR, DP, FFIR utilizing digital tools • Employ digital tools to develop and update FS control products • Integrate maneuver and fires using digital C2 systems • Employ digital capabilities to integrate A2C2 and fires • Use digital tools to monitor allocation and employment of ISR assets • Synchronize sustainment and maneuver operations using digital C2 systems • Employ digital tools to plan, coordinate and conduct battletracking • Direct/track battle damage assessment using digital C2 systems • Use digital tools in planning and conducting AARs

Note: See Appendix C for translation of acronyms

Of the myriad actions that a digital battle staff should perform, the skills and tasks in Table 4 define benchmarks that merit priority attention for training and measurement. The four high-priority user skills, with their equally high-priority user tasks, set the stage for establishing high-payoff digital proficiency targets and the associated measurement requirements for the digitally-equipped brigade or battalion staff. They define high-payoff performance dimensions around which to structure digitally-focused training objectives as well as observation and assessment activities of trainers and observers. They also provide a useful basis for shaping unit training programs and leaders' assessment tools. In the DOFT project, the skills and tasks listed in Table 4 formed the foundation for developing digital battle staff observation guidelines, to be presented in a companion report (Leibrecht et al., in preparation).

The development of ATCCS user skills and tasks, based on critical system capabilities, mirrors the methodology used in previous work with the FBCB2 (Leibrecht et al., 2003a). The common methodology enabled the research team eventually to complete an integrated digital measurement architecture for both maneuver units and battle staffs. The shared methodology was especially important for ensuring consistency of observation guidelines. The companion report (Leibrecht et al., in preparation) will document the battle staff-focused components of the integrated digital measurement architecture.

Network Management Skills

Connecting the ATCCS devices used by the battle staff is the TI—the backbone of the digital TOC. The TI is comprised of a lower TI and an upper TI (the latter is called Warfighter Information Network-Tactical, or WIN-T). The lower TI connects ATCCS components with FBCB2 devices in subordinate units, Mobile Subscriber Equipment (MSE), Near Term Digital Radio (NTDR), Enhanced Position Location Reporting System (EPLRS), and other elements. Position reports from FBCB2 create blue icons and travel from platforms on the lower TI to the WIN-T via carrier sense multiple access (CSMA) servers. These servers link each battalion to the rest of the brigade. Also called SA (situational awareness) servers, they broadcast the battalion's SA picture to the rest of the brigade.

The WIN-T system relies on MSE and satellite capabilities, with MSE serving as the primary data hauler between corps, division and brigade. The WIN-T is the communication infrastructure (with network components) connecting the brigade TOC to division and adjacent elements. In turn, NTDR connects the brigade TOC to maneuver battalion TOCs.

Because a fully functional TI is essential for ATCCS devices to communicate, network management is critical for effective digital operations. The S6 section of the brigade and battalion TOCs is responsible for managing the TI. The ir primary tool for doing so is the Tactical Internet Management Software (TIMS). This software monitors the number of platforms reporting to the lower TI, the operational servers, the NTDR links to the flanking brigades, and the status of SA servers. The TIMS also monitors the MSE component (Small Extension Node) that links the brigade TOC with division and higher elements. All told, the TIMS monitors multiple networks:

- Local area network (LAN)—own TOC
- Subordinate TOC LANs (brigade only)
- EPLRS network (Blue SA conduit)

The TIMS also provides the ability to quickly react to changes on the battlefield. It can execute a TOC reconfiguration allowing new hardware to be added to the TOC, can initiate unit task organization (UTO) changes and then reconfigure the TOC accordingly, and can support C2 registry enabling other ABCS systems to respond to the UTO change.

Another monitoring tool is the "WhatsUp Unix" function. This allows the S6 to follow the communications "path" from platform up to the brigade TOC to determine if the "path" is established and working. The S6 uses "WhatsUp Unix" to troubleshoot detected gaps in Blue SA. The next step in trying to pinpoint gaps in Blue SA is through the SA Monitor function, which identifies platforms with a possible malfunctioning EPLRS radio set.

The S6 section uses the network management tools to maintain digital communications in the brigade/battalion TOC. Table 5 lists key network management skills, along with common troubleshooting queries. Executing the queries proactively and routinely can avoid network problems that could turn into mission-threatening crises. Unit leaders and trainers can use the information in Table 5 to assess the proficiency of battalion and brigade network managers.

Table 5

Key Network Management Skills for the Signal (S6) Section

Network Manager Skill	Critical Network Query
Verify Situational Awareness	• Is SA server active? • Does "WhatsUp Unix" depict a healthy network path? • Does SA monitor depict any malfunctioning EPLRS platforms? • Does connectivity exist with flanking brigades?
Verify Command and Control	• Did brigade receive the division UTO? • Did all platforms receive the UTO change? • Did each Bn transfer updated orders and graphics via MDL?
Verify Network Security	• Are network passwords maintained properly? • Are password files transferred via MDL to subordinates?

Network management at the brigade and battalion TOC is indispensable for effective digital operations. The S6 section not only manages the network software interfaces and the health of the external network, signal personnel manage the TOC intranet connectivity. The S6 sets the network conditions for successful digital communications within the TOC and with elements below and above.

Digital Staff Processes

Critical Functions of the Staff

The responsibilities and functions of a digitally-equipped staff are no different from those of a conventionally-equipped staff. In other words, digital capabilities do not change the nature of battle command. The battle staff serves as an extension of the commander, supporting his information and decision needs. The classic staff processes of planning, coordinating, directing

and monitoring combat activities remain a solid foundation. From these long-established processes, the research team identified nine critical functions for the ATCCS-equipped battle staff (Table 6). The functions are typical of a maneuver brigade staff, but they apply fully to a battle staff in a maneuver battalion.

Table 6

Critical Functions of a Maneuver Brigade Staff, with Supporting ATCCS Applications

Battle Staff Function	Key ATCCS Applications
Ensure the commander's intent is disseminated and executed	• Digital orders and overlays • Digital CCIR, PIR, FFIR, DP • Common Operational Picture • Digital rehearsals
Support the commander's decision making process	• Digital intelligence analysis • Digital terrain analysis • Collaborative planning and wargaming • Digital CCIR, PIR, FFIR, DP
Promote situational understanding within and across echelons	• Common Operational Picture • Digital messages feeding COP • Digital integration and sharing of information • Automated logistics monitoring
Coordinate and synchronize combat activities of subordinate and supporting units	• Collaborative planning and wargaming • Digital synchronization matrix • Automated alerts and warnings • Digital DP (SA-linked triggers)
Acquire, process and share timely and accurate tactical information	• Common Operational Picture • Digital messages feeding COP • Automated target management tools • Digital integration and sharing of information
Assess the effectiveness of combat actions in terms of the commander's intent	• Digital CCIR, PIR, FFIR • Digital battletracking and BDA tools • Digital messages and alerts • Digital integration and sharing of information
Facilitate flexibility of tactical operations (contingencies, targets of opportunity, sequels)	• Digital CCIR, PIR, FFIR, DP • Digital intelligence analysis • Digital messages and alerts • Collaborative planning and wargaming
Preserve and sustain the combat power available to the commander	• Digital airspace/AD management tools • Digital reports and messages • Digital logistics management tools • Automated alerts and warnings
Anticipate and manage operational transition as mission requirements change	• Digital intelligence analysis • Common Operational Picture • Collaborative planning and wargaming • Digital orders and overlays

By design, the ATCCS family of systems provides the digital battle staff with powerful digital tools to help accomplish the full spectrum of staff functions. Table 6 lists the more valuable ATCCS applications that support each staff function. The reader will recognize that the

ATCCS applications of Table 6 are adapted from the capabilities of Table 4, usually in a more generic form. In effect, the presence of digital capabilities changes the way staffs support the commander and set the conditions for mission success. As Table 6 illustrates, most of the ATCCS applications support several staff functions. This attests to the robust capabilities of the ATCCS suite. Though it doesn't appear as a critical enabler for every staff function in Table 6, the COP truly supports nearly everything the digital battle staff does. The same goes for digital reports and messages. Other workhorse applications reside in collaborative planning and wargaming tools as well as tracking critical information requirements and decision points.

To illustrate the impact of ATCCS capabilities on battle staff procedures, consider the development and dissemination of orders and overlays. Each digitally-equipped staff section can prepare their planning products by using digital collaborative tools. These tools enable multiple staff members to work on a specific annex or overlay at the same time, viewing each other's inputs as they go. The draft products can then be circulated digitally (i.e., rapidly and efficiently) among other staff elements for coordination. Once finalized, the owning staff section can distribute the order and/or overlays by posting them to a Web site, by sending them digitally, or by delivering larger files by means of a portable storage device (the Mission Data Loader, or MDL). The digitally-empowered procedures enable paperless preparation and delivery, saving time and resources when compared to conventional procedures.

The high-payoff ATCCS user skills and tasks listed in Table 4 directly support the staff functions appearing in Table 6. The staff functions provide the broad operational framework, while the user skills/tasks highlight the ATCCS foundation upon which to build digital proficiency. For this report, the chief value of the staff functions lies in their utility for examining digital performance dimensions such as specialization among the various staff sections and differences between brigade and battalion echelons. They also afford a framework for considering how ATCCS capabilities contribute to battle staff operations.

Impact of C4I Capabilities on Staff Functions

By giving the battle staff new tools for accomplishing their jobs, advanced C4I systems reshape the detailed procedures used to execute staff functions. Expanding on the functions in Table 6, this section discusses how the systems benefit battle staff procedures and what happens when the benefits are not leveraged.

Ensure the commander's intent is disseminated and executed. Digital tools provide commanders with new ways to describe/depict and disseminate their intent. They give the staff new ways to articulate their response to the commander's intent to include methods for illustrating how their plan supports the intent, making it easier for the commander to conceptualize and evaluate the plan. Digital systems provide new methods for conducting rehearsals, for example, projecting the map where the entire staff can observe the wargaming, countering Red icon movement with Blue countermovement. Intelligence requirements can be identified and can be addressed throughout the wargaming process.

These benefits are lost to the extent that:

- digital planning products are not disseminated in a timely fashion.

- the staff does not make use of digital capabilities to illustrate the quality of planning products (e.g., synchronization of fire support with maneuver).
- digital rehearsals are not conducted.
- expectations regarding the digital products to be produced and received have not been defined by SOP or TTP.

Support the commander's decision-making process. Digital systems provide sources of information (e.g., UAV feeds), analytic tools (e.g., terrain analysis tools), and flexible display capabilities that support METT-TC analysis and presentation of results in a manner that protects the commander from a glut of data while providing insights on the tactical situation. The variety of analytical tools, information sources, and display capabilities is expected to grow as digital systems evolve.

The ability to disseminate the current status of commander's critical information requirements (CCIR), priority intelligence requirements (PIR), friendly forces information requirements (FFIR), and decision points (DP) in attention-grabbing fashion helps to ensure that the unit does not lose track of these requirements or fail to provide the appropriate response when intelligence needs are met. Similarly, system displays can be used to decide when certain types of trigger events occur (e.g., when A company reaches Phase Line Charlie). Decisions can be made based on actual events rather than estimates of the time when events are likely to occur.

These benefits are lost to the extent that:

- the staff is passing on raw digital data rather than fusing and tailoring these data.
- the staff uses conventional means—such as FM radios—rather than digital displays to track trigger events.
- the unit fails to use digital capabilities to track intelligence requirements and decision points.
- expectations regarding the display of intelligence requirements and analytical products have not been defined by SOP or TTP.
- SOPs for controlling views of the battlespace fail to ensure that critical information will be seen by the commander.

Promote situational understanding within and across echelons. Information age tools can be used to fuse raw data to produce a quickly interpretable view of the tactical situation, with the view disseminated instantly throughout the unit. The tools also enable the staff to tailor this view to better meet the specific needs of their echelon. Further, the staff can use C4I capabilities to describe the tactical situation in terms of the status of CCIR, PIR, FFIR, and DP. Such descriptions illuminate implications for the tactical situation.

These benefits are lost to the extent that:

- the staff passes on raw digital data rather than fusing and tailoring the data.
- the staff fails to give intelligence requirements a high digital profile.
- the staff is not including critical information in the tactical views (e.g., making sure the locations of non-digitized friendly elements are displayed).
- SOPs and TTP fail to define expectations regarding the fusion and presentation of data.

- SOPs for controlling battlespace views fail to ensure that critical information will seen by intended recipients.

Coordinate and synchronize combat activities of subordinate and supporting units. The C4I data stream and displays can be used to decide when certain types of trigger events occur. Commanders can make decisions based on actual events rather than estimates of the time when events are likely to occur. Digital wargaming capabilities enable units to try out and refine plans for synchronizing activities among echelons and BOSs. Advanced C4I tools allow the status of the synchronization matrix to be displayed in a high-profile, continuously updated fashion that is enhanced by automated alerts and warnings.

These benefits are lost to the extent that:

- SOPs fail to spell out procedures for digitally displaying trigger events and leveraging alerts and warnings.
- units fail to conduct digital rehearsals to check trigger events and connectivity.
- units do not maintain the quality and completeness of the digital data stream.
- units fail to use digital tools to track synchronization events.

Acquire, process, and share timely and accurate tactical information. The COP and digital messages enable the unit to update higher, subordinate, and supporting elements on the status of a wide range of METT-TC variables (e.g., location of friendly units, location of threat situations). Most of this information can be presented automatically in easy to interpret graphic displays. Digital systems can also use pre-defined criteria to alert units to significant tactical implications as well as battlefield events per se.

These benefits are lost to the extent that:

- units fail to ensure the timeliness, quality, and completeness of instrumented and non-instrumented data on the tactical situation.
- units fail to input information in a form that C4I systems can leverage.
- SOPs for controlling views of the battlespace fail to ensure that information is displayed in ways that are easy to interpret.
- units fail to employ automated alerts available within C4I systems.
- units lack guidance or plans regarding when to check SA displays.

Assess the effectiveness of combat actions in terms of the commander's intent. The improved SA resulting from C4I makes it easier for units to envision and implement plans for tracking the battle relative to the commander's intent. Powerful C4I wargaming capabilities make it readily feasible to try out and refine plans for tracking the battle. By digitally displaying key battlefield events in a shared environment, with robust integration of information, digital systems greatly enhance the battletracking process. In turn, economy of effort may benefit significantly.

These benefits are lost to extent that:

- staffs lack a plan for digitally tracking the battle, or responsibilities for tracking various aspects of the battle are not assigned to specific individuals.
- units fail to rehearse their battletracking plan.

- units fail to ensure the timeliness, quality, and completeness of instrumented and non-instrumented data on the tactical situation.
- staffs fail to use digital capabilities to track battlefield events and decision points.
- unit SOPs for digital battletracking do not exist.

Facilitate flexibility of tactical operations. Digital tracking of intelligence requirements and decision points enables the staff to identify contingencies and targets of opportunity more quickly. Automated alerts contribute significantly to accelerating the process. Digital tools for fusing and correlating data speed the intelligence analysis process. Improved situational awareness and the ability to share evolving planning products among echelons and BOSs can shorten the planning time and enable staffs to consider multiple courses of action. The net result is a decision/response cycle turning considerably faster than the enemy's.

These benefits are lost to the extent that:

- units fail to maintain the timeliness, quality, and completeness of instrumented and non-instrumented data on the tactical situation.
- staff sections do not start sharing planning products until late in the planning process.
- units lack SOPs that facilitate tracking of changes in planning products.
- SOPs omit procedures for identifying the most recent versions of digital files.
- units lack digital SOPs for producing and disseminating planning products on the fly.

Preserve and sustain the combat power available to the commander. Improved SA makes it easier for a unit to stay out of harm's way, including fratricide-prone situations. Automated alerts and alarms can help reduce the need for command and staff to continually monitor high-risk aspects of the tactical situation. Improved awareness of the locations of friendly vehicles facilitates casualty evacuation and vehicle recovery, even in cases where visibility is limited. Digital capabilities provide units with precise information about the location and status of supply points, and they facilitate navigating to them. Improved SA combined with the use of analytical tools can even make it easier to predict where and when combat service support and combat support are likely to be required.

These benefits are lost to the extent that:

- leaders fail to ensure manual entry of icons for non-reporting personnel and vehicles.
- units fail to employ automated alerts available within C4I systems.
- units fail to ensure the timeliness, quality, and completeness of the C4I data stream.
- staffs fail to employ terrain analysis tools and other digital tools to help predict how the tactical situation is likely to unfold.
- units fail to use C4I logistics management tools to track personnel and supply status.

Anticipate and manage operational transition as mission requirements change. Improved SA and SU should make it easier to determine when mission requirements are about to change. Digital intelligence analysis tools bolster the staff's assessment process. Digital collaborative planning tools enable the staff to accelerate the transition process and minimize the loss of combat momentum. Digital wargaming capabilities speed the analysis of candidate COAs and reduce the risk accepted as part of the decision making process. The capability to disseminate information electronically should make it easier to implement changes in plans.

These benefits are lost to the extent that:

- units fail to maintain the timeliness, quality, and completeness of the C4I data stream.
- staffs fail to employ analytical capabilities (e.g., digital intelligence analysis tools) to help predict how the tactical situation is likely to evolve.
- staff elements fail to exploit digital collaborative tools to synchronize across BOSs.
- units lack digital SOPs that facilitate wargaming and selection of COAs.
- SOPs omit digital procedures for managing battle transition.
- units lack digital SOPs for producing, disseminating and tracking planning products.

Battle Staff Integration

Contemporary battle staffs of the U.S. Army operate under a standard organizational structure. A family of staff sections and other elements contains primary and special staff officers with their supporting experts. With two exceptions, these elements are common to both the brigade and battalion echelons. The principal elements include:

- S1, Personnel Section
- S2, Military Intelligence Section
- S3, Plans Section and Operations Section
- S4, Logistics Section and FSB Support Operations
- S5, Civil Affairs Team (brigade only)
- S6, Signal Section
- Fire Support Element
- Air Defense Section (brigade only)
- Engineer Section
- Chemical Section
- Air Liaison Officer

Staff responsibilities are allocated among these separate staff elements, but operational requirements drive essential dependencies among them. Battle staffs working to synchronize combat assets must collaborate extensively, integrate critical products, and converge combat efforts according to the commander's intent. As a result, integration across staff sections/teams receives substantial doctrinal emphasis (e.g., U.S. Department of the Army, 2002).

Only selected staff elements have dedicated ATCCS systems. This reflects the ABCS emphasis on the high-priority BFAs. Elements such as the Civil Affairs Team and the Chemical Section either continue to use analog tools or share digital devices with other sections. This report focuses the discussion of battle staff integration on the elements aligned most closely with the BFAs.

Battlefield Operating Systems (BOSs). Under the Army's Blueprint of the Battlefield (U.S. Army Training and Doctrine Command, 1990), BOSs specify the major combat functions for the tactical level of war. By definition, BOSs are "The major functions occurring on the battlefield, performed by the force to successfully execute operations (battles and engagements)"

(U.S. Army Training and Doctrine Command, 1990, p. 4). The seven BOSs, listed in Table 7, apply to all tactical echelons.

Table 7

List of BOSs with Staff Leads and Supporting ATCCS Tools (Brigade Echelon)

BOS	Staff Lead	ATCCS Tools
Command and Control	S3-Operations	MCS-WS, MCS-L
Maneuver	S3-Plans, S3-Operations	MCS-WS, MCS-L
Intelligence	S2	ASAS-RWS
Fire Support	Fire Support Officer, S3-Air	AFATDS, MCS-L
Mobility/Countermobility/Survivability	Engineer	MCS-L
Air Defense	Air Defense Officer	AMDWS, FAAD
Combat Service Support	S1, S4	CSSCS, MCS-WS, MCS-L

Each BOS encompasses an area of combat specialization that involves a modest set of subfunctions. For example, the maneuver BOS involves three subfunctions—moving forces, engaging the enemy, and controlling terrain. In principle, all BOSs apply to any tactical unit, regardless of type or echelon. For this report we focus on mounted forces such as armor brigades and mechanized infantry or armor battalions. In the staff arena BOSs align predominantly with one or more sections or teams, as seen in Table 7. Thus, the S2 section serves as the staff lead for the Intelligence BOS, and the FSO and S3-Air collaborate to take lead responsibility for the fire support BOS. In practice, the staff lead picture portrayed in Table 7 is oversimplified. This becomes especially clear in the command and control BOS, where nearly every staff section plays a substantial role in planning and executing battle command of subordinate units. In the main, however, the BOSs give an overall indication of specialization among the various elements of brigade and battalion staffs.

The ATCCS family of systems empowers the battle staff with digital capabilities for accomplishing BOS functions and subfunctions. Five ATCCS components serve as the principal digital tools for performing BOS activities: MCS, ASAS, AFATDS, AMDWS, and CSSCS. In reality, MCS comes in two variations—MCS-Workstation (MCS-WS) and MCS-Light (MCS-L). Similarly, ASAS exists in two versions—ASAS-Remote Workstation (ASAS-RWS) and ASAS-Light (ASAS-L). Table 7 shows the global allocation of ATCCS systems by BOS for the brigade staff. The battalion staff generally mirrors this pattern of ATCCS allocation, except for the absence of the AMDWS. In the battle staff operating environment, each section or team has its own specialized tools for accomplishing assigned responsibilities. However, some elements (e.g., Civil Affairs Team, Chemical Section) share ATCCS devices with other sections in the absence of a dedicated digital system. At the battalion echelon, staff elements commonly share digital devices because they have only half as many digital systems as does the brigade staff.

The structure of the staff naturally distributes functions in what is commonly known as a "stovepipe" arrangement, which aligns generally with BOSs. The separation of functions is reinforced by different ATCCS systems that also align loosely with BOSs. (Actually, the Army's digitization community created derivative battlefield functional areas [BFAs] to align more closely with the ATCCS structure.) The separation of functions and tools poses a

challenge for battle staffs working to synchronize combat efforts and accomplish a unified mission. Integration across BOSs takes on special importance for achieving mission success.

BOS Integration. The concept of BOS integration receives frequent mention in doctrinal publications, especially those dealing with training (e.g., U.S. Department of the Army, 2002). Though not formally defined, the term refers to processes for merging the functions of two or more BOSs to achieve a unified combined arms effort. The purpose of BOS integration is to coordinate and synchronize combat, combat support, and combat service support activities. The desired outcome is the application of the unit's warfighting assets in concert, at the right time and place, to implement the commander's intent.

Analysis of BOS integration in the ATCCS environment yielded a half-dozen processes for brigade and battalion staffs (Table 8). At its core, BOS integration involves sharing of information, activities, and products among separate staff elements. As a form of collaboration it is a hallmark of the collective action typifying a proficient battle staff. Depending on the staff function at work, the collaboration may include some or all of the battle staff sections and teams. Preparation of tactical orders, for example, should involve every staff element. On the other hand, development and management of targets normally revolves around the S2, S3, Engineer, ALO, ADA and Fire Support elements.

Table 8

BOS Integration Processes, with Supporting ATCCS Applications

Integration Process	Key ATCCS Applications
Share/exchange information between BOSs	• Shared folders, file transfer • Web site posting and access • Automated forwarding of information
Actively interact, coordinate and collaborate across BOSs	• Conference tools (chat, whiteboard) • Application sharing and collaboration • File transfer (send, receive)
Synchronize activities of related BOSs	• Digital synchronization matrix • Digital CCIR, PIR, FFIR, DP • COP-based SA and SU
Circulate staff planning products for review by other BOSs	• Shared folders • Web site posting and access • File transfer (send, receive)
Integrate separate BOS inputs into unified products	• Shared folders, file transfer • Application sharing and collaboration • Digital fusion of information
Plan and execute multi-BOS rehearsals	• Digital orders and overlays • Conference tools (chat, whiteboard) • Digital rehearsal capabilities

The ATCCS family of systems provides powerful digital applications directly supporting BOS integration. Table 8 lists the key digital applications that facilitate sharing of information, activities, and products. Here again, we see that certain applications, such as shared folders and file transfer capabilities, support several battle staff processes. When fully exploited, the

ATCCS applications accelerate mission planning, improve the quality of staff products, speed dissemination of those products, and increase the probability of mission success.

The BOS integration processes appearing in Table 8 link closely with the majority of the ATCCS user skills and tasks listed in Table 4. Establishing/managing the COP and managing digital information comprise instrumental tasks that set the conditions for sharing information, products, and activities. Integrating battle command functions goes directly to the heart of staff collaboration and synchronization, keystone aspects of BOS integration. The BOS integration processes frame a collaborative environment for staff elements to apply high-payoff ATCCS skills and tasks. Thus the integrative processes of Table 8 highlight the practical value of becoming proficient with digital collaborative tools.

In the context of the staff functions listed in Table 6, the BOS integration processes represent the coordination/collaboration slice cutting across all of the functions. In this sense, the integration processes of Table 8 support all of the battle staff functions, helping to synchronize efforts. Some of the same ATCCS features come into play in both arenas, as in the case of digital messages and information requirements (CCIR, etc.). Many of the applications in Table 8 represent more specific aspects of applications listed in Table 6, especially in the case of digital collaborative tools such as conferencing and application sharing. Paying special attention to BOS integration is useful because of the importance of battlefield synchronization.

Since BOS integration is one of the more difficult challenges for a battle staff to master, the risk of incomplete or inefficient integration is serious enough to threaten battle staff effectiveness. The challenge is greater in the ATCCS-equipped TOC because optimizing collaborative processes leads staff sections and teams into the world of truly advanced computer tools. Exploiting ATCCS collaborative tools requires both new technical skills and new ways of approaching staff functions. Meeting the challenges through focused training should be a commanders ability, because failure to optimize the integration processes can threaten mission accomplishment. Incomplete or inefficient BOS integration can lead to planning delays, poor quality products, avoidable confusion resulting from overly stovepiped actions, and increased execution risks. These risks highlight the imperative to become proficient with digital collaborative tools.

The BOS integration processes discussed in this section can help focus measurement issues and efforts for training digitally-equipped battle staffs. The processes listed in Table 8 comprise an essential aspect of battle staff operations. They define high-payoff collaborative activities to build into battle staff training exercises, and they influence observation and assessment activities of trainers and observers. As a supplement to the ATCCS user skills and tasks presented earlier, they can enhance unit training programs and leaders' assessment tools.

Impact of C4I Capabilities on BOS Integration Processes

As with basic staff functions, the availability of C4I tools influences the procedures battle staffs use to accomplish BOS integration. This section discusses how specific digital capabilities benefit the BOS integration processes listed in Table 8.

Share/exchange information between BOSs. Common directory structures can make it easier for one BOS to locate relevant information produced by another BOS. In situations where a unit plan provides for contingent operations and/or phases of mission execution, the directory structure should reflect the contingencies or phases to avoid confusion. The posting of products on web sites for easy access, SOPs for transferring files (applicable to senders and recipients), and provisions for automatically forwarding certain types of information to particular recipients combine to facilitate the exchange of information among BOSs. Carefully crafted methods for organizing and integrating digital data are required to avoid a confusing glut of data. The SOPs for managing information must be compatible across BOSs and echelons.

Actively interact, coordinate and collaborate across BOSs. Conferencing tools can be used to facilitate collaborative activities at various points during mission planning, preparation and execution. Early on, these conferences focus on important issues to be addressed by the plan. Later in the planning process, these conferences may involve reviews of complete or near complete planning products and may include displays that illustrate how well plan components have been synchronized. Digital capabilities for sharing applications and information can speed the preparation, coordination and integration of planning products.

Synchronize activities of related BOSs. Advanced C4I systems provide wargaming and conferencing capabilities that support the identification and resolution of BOS synchronization issues. Information regarding the status of many of the events representing BOS synchronization triggers (e.g., CCIR, FFIR) can be provided in C4I displays. Digital systems also include the capability to share a common synchronization matrix among BOSs to help make sure that triggers and decision points are visible and up-to-date. Of course, the COP enables enhanced SU to support better coordination and integration of combat, combat support, and combat service support activities.

Circulate staff planning products for use by other BOSs. Coordination among BOSs is facilitated when SOPs define the products expected from each BOS, as well as the actions to be taken when products are received from other BOSs. In many instances the SOPs should also include the relative time when products should be delivered or made available to other BOSs. Shared folders, web site posting, and file transfer capabilities accelerate the exchange of products among the various staff sections. It is important that someone keep track of the flow of information to make sure that critical input has not been missed.

Integrate separate BOS inputs into unified products. Modern C4I systems provide the ability to prepare displays that show how the various BOSs plan to work together to support the mission. This requires each BOS to input information in a format that supports the process of preparing unified products. For example, various BOSs may provide input regarding the planned positions for intelligence, surveillance, and reconnaissance (ISR) assets they control. The S2, in conjunction with the S3, may consolidate this information in a single graphic, make changes in the planned positioning of assets to meet intelligence requirements more effectively, and make the unified display available to all. The S2 may even add information such as the results of line-of-sight analyses. The job of integrating separate inputs into a unified product requires creating and implementing SOPs that reduce the possibility of tasks having to be repeated. In the case of preparing a unified picture of ISR assets, for example, the S2 may want to check each separate

input to make sure all ISR assets have been addressed before constructing a consolidated picture and adding information (e.g., line-of-sight results).

Plan and execute multi-BOS rehearsals. Digital systems offer the ability to conduct rehearsals in a setting where a unit can step through many of the trigger events using displays that look similar to what unit members will see during missions (e.g., your performance of this task will be triggered when you see this situation on your SA displays). In addition to refining trigger events, the rehearsals should make sure that necessary connectivity has been established among various BOS elements. A BOS synchronization matrix visible to all participants is an important foundation for these rehearsals. An important outcome of the rehearsals is the identification of individuals responsible for tracking digital or analog trigger events in the synchronization matrix. Otherwise, everyone is likely to assume that someone else is tracking the triggers.

Differences between Echelons

The digital skills performed by a battle staff are very similar between brigade and battalion echelons. The differences become apparent in the management of the digital feeds and information received at brigade versus battalion and how each echelon uses the information. In a previous project that explored echelon differences in digital performance, Dudley et al. (2002) concluded the following:

> "The battalion is becoming mainly execution-focused, while the brigade focuses increasingly on planning, integration, and synchronization. ... In the emerging network centric framework, the battalion tends to focus more on execution and less on planning. The battalion is a capabilities-based organization that is becoming less involved in planning and more occupied with synchronizing near-term effects for decisive operations." (p. 12)

The DOFT team concluded the main difference between brigade and battalion digital staffs lies in processing and integrating digital and analog information. The means of processing and disseminating information illuminate the echelon differences, especially in the area of integration. The brigade staff draws on multiple digital feeds to accomplish their integration. An efficient brigade staff will push the integrated information the battalion requires to execute their mission. This reduces the amount of time spent on staff integration and wargaming at the battalion level, freeing more time for preparing and executing the mission

Table 9 shows how the distribution of ATCCS devices varies between echelons. As a general rule, battalion and brigade staffs receive and process digital information in order to answer different requirements. The brigade focuses on planning while the battalion focuses more on execution. The brigade shapes the battlefield, setting the conditions for the battalion's successful execution. A variety of tools supports shaping operations—UAV, remote sensors, Guardrail, counterfire radar, Sentinel radar and JSTARS. The brigade also has access to digital information from joint and combined sources through satellite feeds. Overall, the brigade can filter and funnel the information received from the upper and lower TI, sending battlespace-

specific information to the battalion. The battalion typically pulls digital information while the brigade typically pushes it.

Table 9

Distribution of ATCCS Devices by Echelon and Component (1st Cavalry Division)

	Brigade (Armor)			Battalion (Cav Regt)	
ATCCS	TAC	TOC	ALOC	TOC	CTCP
MCS	1 (WS), 1 (L)	2 (WS), 5 (L)	1 (WS), 1 (L)	2 (WS), 2 (L)	1 (WS)
ASAS	1 (RWS)	3* (RWS)		1 (L)	
AFATDS		2		1	
AMDWS		1			
FAAD		1			
CSSCS			1		1

* Includes 2 ASAS-RWS in the Analysis and Control Team

Each brigade staff section receives and processes data from ATCCS and other sources. Data fusion occurs when multi-source information arriving in the TOC is amalgamated within and across BOSs to enable a clear COP. Fusion involves managing data to ensure that key elements of information emerge conspicuously from the clutter of available information. With fused data in hand, the brigade staff determines how the information impacts the mission and battlespace of subordinate battalions. The information (the product of data fusion) is then sent to the pertinent battalion TOC(s). By filtering, correlating and fusing data the brigade staff reduces the workload of the battalion staff. The brigade staff transforms a potentially overwhelming amount of data into information the battalions can use directly.

An example of the data fusion process comes from the Analysis and Control Team (ACT) allocated to the brigade from division. The ACT has the primary responsibility to process intelligence information and disseminate it to the battalion. This team, equipped with two ASAS-RWS computers, is the entry point for large amounts of intelligence data and information received from sensors, UAV and JSTARS. The ACT assists the brigade S2 section as it reduces the high-volume information, focusing on the current threat in the brigade's battlespace. The brigade S2 relates the Red picture to the Blue mission and sends to each battalion S2 the information that applies to their battlespace. This reduction in "information overload" at the battalion echelon allows the battalion battle staff to focus on the current fight. It also allows them to spend less time on the planning phase and more on the preparation and execution phases of the mission.

Another area where the digital processes differ between the two echelons is the creation and dissemination of orders and graphics. The brigade staff creates orders and graphics using MCS-L. They upload these products into folders on the MCS TOC server, from which battalion staff members can download them. The brigade also can transmit orders and graphics from their MCS-L to the battalion. If the battalion staff is highly proficient, they download the information, including required map files, from the brigade TOC's MDL onto their battalion MDLs. (Each

maneuver battalion is authorized two MDLs for its TOC and two per line company.) The high-proficiency battalion staff then transfers data to the company MDLs, which are used to transfer the products to each vehicle's FBCB2.

The speed of transmission slows down dramatically if the battalion staff does not use the MDL and attempts instead to distribute this information down to platform level on the lower TI. Graphics and orders created and disseminated on MCS may not transfer properly to FBCB2 due to FBCB2 file size limitations. Any file exceeding 576 Kb should be relayed via MDL, or else the battalion staff must recreate it in FBCB2 and send in increments, or switch to analog procedures.

The brigade TOC includes an Air Defense section with an AMDWS and FAAD, whereas the battalion TOC does not. The AMDWS capabilities include providing air tracks (for fixed/rotary wing aircraft, cruise missiles, and UAVs) and air strike warning messages. The system also supports threat analysis of enemy air avenues of approach. The brigade Air Defense Officer is responsible for building the ADA overlay and is part of the staff planning cell. The Air Defense section uses AMDWS to send the ADA overlay and subsequent updates to the battalion TOCs, where they are received on MCS-L. Here again, the brigade staff fuses data to produce useable information so the subordinate battalions can concentrate on executing the mission.

Another system present only in the brigade TOC is the Digital Topographic Support System (DTSS). Housed in a mobile shelter, this system is a division asset allocated to the brigade Engineer section. It receives, stores, retrieves, creates, updates and manipulates digital topographic data. The brigade staff turns to the DTSS team for digital and hardcopy 3D terrain products to support the MDMP. Using the specialized DTSS tools, the brigade staff executes responsibilities for tailoring the terrain portion of the COP and analyzing key terrain aspects of the mission. The staff then integrates pertinent information into OPORDs and overlays, and may provide tailored topographical information and products to subordinate battalions. This is a special case where the brigade staff generates and integrates information that reduces the information processing load in the battalion TOC.

To the casual observer, there may appear to be few differences when comparing battalion and brigade TOC operations. A closer look at the brigade push of digital information to battalion, how the brigade shapes the battlefield, and brigade-specific C4I equipment reveals how these two echelons differ. Trainers and evaluators should consider the variations when planning and executing battle staff training exercises at one echelon or the other.

Digital versus Analog Processes

Digitization compresses the military decision making process due to the rapid receipt and analysis of information. It also allows concurrent development of products and their quick dissemination. The many benefits of digitization notwithstanding, some processes should still be carried out using analog methods. This conclusion was reached as a result of interviews and observations of the 1CD during digital training and field exercises. The decisive factors in determining whether or not a task or process should be accomplished in analog or digital mode

depends on METT-TC, time considerations, and the decision maker. For example, recent reports from Soldiers deployed to Operation Iraqi Freedom and Operation Enduring Freedom indicate that digital communications repeatedly were the only means available due to the dynamics of today's battlefield.

To identify which digital battle staff functions should be performed in analog mode, the DOFT team turned to digital SMEs. The team's experts compiled a list of actions that are best accomplished with non-digital tools and procedures. They then flipped the coin over to identify functions that should be performed digitally in spite of strong tendencies to use analog procedures. In the aggregate, the SMEs used the following criteria in this analysis:

- Potential loss of life (favors analog procedures)
- Time sensitivity or urgency (favors analog notification procedures)
- Need for absolute accuracy or precision (favors digital procedures)
- High value of automated alerting (favors digital procedures)
- Accelerated processing speed (favors digital procedures)
- Battlefield visualization linkage (favors digital procedures)
- Efficiency of effort (can favor analog or digital procedures)

Table 10 presents the results of the SME analysis. It lists analog-preferred functions as well as critical functions for which digital procedures are imperative because of limitations in analog procedures. The table includes justification for recommending the form of execution. The recommendations are guidelines only. The choice of digital versus analog means depends on METT-TC factors and must be tempered by the warfighter's seasoned judgment.

Some staff processes begin as analog and are transformed into digital form. Personnel rosters must be entered manually into the system in order for the PERSITREP to flow from FBCB2 up to the brigade administrative/logistics operations center (ALOC). Another analog process that becomes digital is the UTR/UTO. Typically, the brigade commander or S3 advises the S6 what the organization for combat will be. The S6 must manually enter this UTR into TIMS. Once entered, the UTR can be executed as a message to the lower TI or transferred via MDL. A final example of analog to digital processes involves AFATDS. Operators receive guidance from higher, then manually enter targeting parameters into the system.

Battle staffs at both echelons must be prepared if digital systems fail. All leaders interviewed recommended that one system in the TOC serve as the digital library where orders, graphics and other critical items are stored. This repository is usually the MCS-WS. Most staffs the team observed also kept an analog map board periodically updated as backup. An option to the map board is to print periodic snapshots from MCS-L in the TOC. This could also be used later for AAR purposes.

Digital tools have reduced the planning time spent by staffs, allowing more time for the mission executors. As noted above, digital processes do not always replace analog. Unit SOPs should specify which processes are more effectively accomplished by analog means and which are more effectively accomplished digitally.

Table 10

Recommendations for Performing Digital versus Analog Functions

Function	Echelon	Method	Justification
Mission Planning			
Placement of Recon Assets	Bde and Bn	Digital	Using CLOS tool accurately confirms terrain coverage. Manual icons and NFZ in COP reduce fratricide risk for Recon assets.
Coordination with non-digital units (e.g., coalition forces)	Bde and below	Analog	LNOs require hard copy products to disseminate to their lower echelons.
Terrain Analysis	Bde and Bn	Digital	Digital terrain analysis is much faster and more accurate. Use digital tools in obstacle planning, IPB, fire support and maneuver planning.
Wargaming	Bde and Bn	Digital	Entire battlestaff can view/participate in war-gaming. MCS-L speeds up the process.
Orders and Graphics Production	Bde and below	Digital	Digital tools speed up preparation/distribution and expand understanding of the mission.
Establishment of Battlefield Geometry	Bde and below	Digital	Digital process saves time (hardcopy must be manually entered into AFATDS).
Mission Execution			
Clearance of Fires	Bde and below	Analog	Fratricide prevention is imperative. (Denial of fires may be digital, but clearance of fires should always have "eyes on".)
Call for Fire (CFF)	Bn and below	Digital	Facilitates fratricide prevention. Digital CFF puts target icon on COP and alerts platforms if they are danger close.
Early Warning	Bde and below	Digital then Analog	Notification of Red Air is an urgent alert best done via FM, after it digitally enters brigade TOC from FAADC3I, to enhance force protection.
Battle Update Briefing Charts	Bde and Bn	Analog/ Power Point	MCS-L charts are cumbersome. Users can keep PowerPoint® charts minimized at their workstation and update them as needed.
Initial alert of threat in AO (NBC, Spot report, minefield, etc.)	Bde and below	Analog, w/digital follow-up	Initial alert should go out via FM due to urgency. Follow up with digital message so threat icon appears on COP.
Battletracking	Bde and below	Digital	Provides more complete picture. Digital systems overcome limited visibility.
Tracking of Logistics Assets	Bde and below	Digital	Lines of communication may not permit FM communications.
Serious Incident Report	Bde and below	Analog, with digital follow-up	Serious incidents can have immediate, critical impact on combat power and decision points.

Unit Standing Operating Procedures (SOPs)

Battle staffs rely on SOPs to specify and standardize TOC operating techniques and procedures. For a digitally-equipped staff, TOC SOPs play a critical role in detailing the procedures for exploiting ATCCS and other digital systems. The SOPs should procedurally link specific digital capabilities with basic staff functions and processes. For example, staff officers

need to know which overlays and live feeds comprise the COP and what filter settings to use for a particular type of mission. The guidance contained in the TOC SOPs shapes battle staff expectations for planning, directing and synchronizing the combat activities of subordinate and supporting units. To the extent that TOC SOPs provide specific guidance for exploiting ATCCS capabilities, critical conditions are set for developing digitally proficient staff sections and teams. The SOPs can also convey why it is important to use the digital capabilities. Finally, ATCCS procedural standards point to potential targets for measuring digital proficiency.

As reported previously (e.g., Dudley et al., 2001; Leibrecht et al., 2003a), digital SOPs have been slow to emerge. This is true for battle staffs as well as maneuver elements. The absence of published digital TTPs and the lack of resources and time appear to be the primary reasons. In the Army's Force XXI environment, a heavy burden fell on the staff leaders to document how ATCCS capabilities can be exploited and then incorporate the discoveries and lessons learned in the TOC SOPs. The discovery and documentation process is progressive. For example, once the S3-Plans section starts producing orders and overlays with MCS, the specifics of constructing and managing operational and SA overlays come into play. How can the cumbersome process for creating overlays be streamlined? How can digital collaborative tools such as application sharing be used to speed the production process? What digital techniques work best for assembling and integrating input from different sections? What backup and archiving procedures are sufficient? The progressive process, coupled with the fielding of updated software versions, means that TOC SOPs need to be updated frequently.

Digitally focused TOC SOPs are now emerging among Force XXI and Stryker units. Prime examples are the TOC SOPs of the 1st BCT ("Ironhorse"), 1CD and the 3rd BCT (Stryker), 2nd Infantry Division. The Ironhorse SOP begins with figures illustrating the brigade TOC configuration, including the layout of ATCCS workstations and networking specifications. The SOP organizes detailed procedures (both digital and analog) in matrix format. The matrix includes information on digital activities, file names and locations, and digital systems to be used. The Stryker SOP contains similar components, with step-by-step presentation of procedural information. As digitization of tactical units proceeds, digital SOPs for battle staffs can be expected to become increasingly common and mature.

Because SOPs define performance expectations, they are key enablers of digital staff proficiency. The more complete and mature the SOP, the higher the likely proficiency of the staff. Ideally TOC SOPs would reinforce the high-payoff ATCCS capabilities and user skills presented in this report. Eventually unit-generated TOC SOPs may well be incorporated in digital TTP used across the Army.

Digital Staff Proficiency

Digital Proficiency Levels

Leaders of digital units and battalions need to know how well their battle staffs are exploiting available ATCCS capabilities. The knowledge is essential for identifying training needs and shaping training programs for the digitally-equipped staff. To assess how well their staff sections and teams are using digital capabilities and information, leaders should be able to

depend on diagnostic tools built around indicators of digital proficiency. To be useful for assessing proficiency, the tools should link digital performance to battle command functions and should provide meaningful gradations of skill levels.

Meliza (in preparation) developed a framework and methodology for establishing graduated levels of digital proficiency. He first identified clusters of high-priority digital skills, then developed multiple descriptors of proficiency for each cluster, and finally arranged the descriptors in a progressive sequence ranging from low to high. His resulting family of criteria emphasized qualitative changes in performance as digital operators/users gain higher and higher levels of proficiency based on training and experience. The DOFT research team applied Meliza's general methodology in developing proficiency level descriptors for the ATCCS-equipped battle staff.

The DOFT team first identified the staff sections likely to be of greatest concern or interest to a commander. The chief criteria included primary BFA status, the role of ATCCS capabilities, and established Army conventions. The process resulted in selection of the following staff elements to focus the analysis of digital proficiency levels:

- S2 Section
- S3-Plans Section
- S3-Operations Section
- Fire Support Element
- Air Defense Artillery Section
- Administrative/Logistics Operations Center or Combat Trains Command Post

The team next identified parameters that would best reflect a growing proficiency in exploiting ATCCS capabilities. This step revolved around the ATCCS user skills and tasks developed earlier in the project (Table 4). The process relied primarily on SME knowledge to prioritize key ATCCS applications, in the context of critical staff functions (Table 6). The process was iterated for each of the staff elements selected for analysis. Across the six elements, the effort yielded the following parameters:

- Managing the COP and its components
- Creating and updating staff products, especially planning products
- Distributing, disseminating, and sharing products
- Accomplishing BOS integration and collaboration
- Reducing the time required for staff planning
- Managing information available on the digital battlefield
- Battletracking, including battle damage assessment
- BOS-specific tasks (e.g., intelligence planning, targeting, logistics management)

The team's SMEs applied their knowledge to list the critical performance dimensions of each parameter. For example, "creating and updating staff products" ended up with three critical performance dimensions: (a) the means used to create and update staff products (analog tools, simple digital tools, or advanced digital tools), (b) staging of the production process (staggered vs. concurrent), and (c) frequency of updates. To structure the translation of performance dimensions into proficiency level descriptors, the team used three levels of proficiency—low, medium, and high. These levels were deemed to be useful and manageable from a commander's

perspective. The team translated each performance dimension into C4I-focused performance descriptors for low, medium and high levels of proficiency. They took care to craft descriptors that are observable using objective means. As an example of finished proficiency descriptors, consider the means used to create staff products:

- Low proficiency—use simpler digital tools for selected products.
- Medium proficiency—use moderately efficient digital tools for most products.
- High proficiency—use most efficient digital tools for all products.

For each staff section, the team assembled the final set of parameters with their proficiency level descriptors in matrix format (Table 11). Only those parameters with the highest payoff made the final cut for a given section. The wording of the proficiency descriptors was tailored to the specific environment of the staff section. Each proficiency level matrix was reviewed by SMEs outside the team and refined by incorporating their input. The outside experts included digital leaders in 1CD. The final set of proficiency level matrixes appears in Appendix B.

Table 11

Format of Digital Staff Proficiency Level Matrixes, with Sample Entries

Parameters	Staff Proficiency Levels		
	Low	**Medium**	**High**
Creation/Updating of Products	Create products using analog and digital tools, staggering production; update rarely	Create most products using less efficient digital tools, concurrently; update frequently	Create all products using most efficient digital tools, collaboratively; update continuously
BOS Integration	Coordinate sporadically across BOSs using analog means, integrate digital products near end of planning	Share information across BOSs using less efficient digital means, integrate products late in planning	Conduct seamless BOS integration using digital collaborative tools, integrate products continuously
Management of Information	Manage flow and fusion of ATCCS information using analog procedures, without awareness of digitally unique aspects	Use simple standardized digital procedures (e.g., filter settings, file/folder naming conventions); react to fusion needs	Use advanced standardized digital procedures (e.g., chart tabs, shared folders, JVMF messaging); anticipate fusion needs
Distribution of Products	Distribute products via analog or physical means, with significant delays	Distribute most products by posting on web page, with minor delays; notify recipients sporadically	Routinely transfer products digitally, without delay; notify recipients promptly; post backups on web page

The primary value of the proficiency criteria in Appendix B lies in their implications for training digital battle staffs. The matrixes can be used diagnostically to help digital leaders identify training needs and shape training programs for their ATCCS-equipped staff. The progressive nature of the low-to-high criteria can help illuminate a step-wise path to full exploitation of ATCCS capabilities. For a given exercise, the digital skills benchmarks can help determine realistic training objectives geared to the staff's pre-exercise level of proficiency. Equally important, the matrixes can help trainers and evaluators tailor measurement and

feedback procedures to the needs of a specific staff. Focusing on achievable proficiency targets can help ensure success at every step along the path to high proficiency.

The proficiency level matrixes distill the digital experience and knowledge accumulated in the Force XXI environment of Fort Hood. They provide realistic benchmarks for gauging how well an ATCCS-empowered staff is employing the digital tools and information available to enhance performance. The set of matrixes covers the high-visibility battle staff elements where the payoff from exploiting digital capabilities should be greatest. Every matrix applies equally to brigade and battalion staffs, exception for the Air Defense section found only at brigade level. On balance, they form a valuable addition to the emerging digital measurement architecture.

Measurement Implications

From a digital proficiency perspective, measuring the performance of a battle staff is more complicated than it is for a maneuver element such as a company or platoon. To begin with, different types of specialized C4I systems are used by the staff, in contrast with the singular FBCB2 used by companies and lower echelons. Some staff sections and teams do not have an ATCCS device available, except perhaps on a shared basis. Further, certain functions continue to be executed by analog means. A major staff feature is the BOS-driven specialization of functions across the various staff sections and teams. Paralleling this dispersion of functions is the imperative to accomplish BOS integration in a virtual collaborative fashion. The information management environment is more complex, owing in part to the large volumes of multi-source raw data entering the TOC (especially at brigade level) and the accompanying data fusion challenges. These and other factors pose greater challenges for observers responsible for measuring digital staff proficiency. Providing adequate coverage for staff performance assessment and feedback requires careful planning of observer staffing, C4I monitoring, and sources of data (both digital and analog).

Measuring the proficiency of ATCCS-equipped battle staffs is imperative to enable units to realize the full potential of the TOC-centered digital capabilities. Effective training requires achievable, operationally based measures of how well staff sections and teams are exploiting their digital tools. Failure to assess digital skills proficiency ensures that battle staffs will fall seriously short of their combat effectiveness potential, probably without realizing it. At the same time, measuring digital staff proficiency must be managed and tailored to focus the performance assessment process. To a large extent, focusing the assessment process means establishing high-payoff proficiency targets. Doing so can greatly enhance the training value, or return on investment, that the units receive.

Digital skills that contribute critically to tactical performance point directly to high-payoff proficiency targets. The high-priority ATCCS user skills and tasks identified in the DOFT project (Table 4) can be used to focus the observation and feedback processes. These benchmarks define the digital performance dimensions that most warrant the attention of trainers and observers. The highlighted ATCCS user tasks set the stage for creating measures of digital proficiency that can optimize performance assessment procedures and enhance training payoff. A companion report (Leibrecht et al., in preparation) will present detailed digital proficiency observation guidelines by staff section.

Clearly BOS integration provides a valuable dimension for focusing training programs designed for the digitally-equipped battle staff. The BOS integration processes discussed earlier in this chapter (Table 8) can help focus measurement issues and efforts. The processes listed in Table 8 should influence observation and assessment activities of trainers and observers. For example, observing the staff's use of digital collaborative tools (e.g., whiteboard, application sharing) can provide important measures regarding operational effectiveness. When used in concert with the ATCCS user skills and tasks (Table 4), the BOS integration processes can focus measurement and feedback on essential dimensions of staff operations. Especially for a basically competent staff, concentrating on BOS integration can accelerate the development of higher levels of digital staff proficiency.

The digital proficiency matrixes developed in this project (Appendix B) can play a key role in training ATCCS-empowered battle staffs. For each major staff section, a matrix describes levels of proficiency built around critical performance parameters. The family of proficiency descriptors illuminates criteria for low, medium and high levels of staff digital competence. Leaders and trainers can use the matrixes diagnostically to determine training needs and specific exercise objectives. One advantage of the proficiency benchmarks is their pre-exercise utility for shaping observation and feedback approaches. Knowing a unit's overall level of experience or proficiency beforehand can help observers decide whether to focus on basic digital skills or more advanced applications (Meliza, in preparation). Additional efforts may be desirable to refine or expand the matrixes and optimize their utility.

The training and feedback needs of a battle staff depend on a host of factors including echelon, specific training objectives, the staff's pre-exercise level of proficiency, and special areas needing emphasis. To meet diverse needs, trainers and observers should be prepared to tailor each training exercise, especially the observation and feedback procedures, to optimize the training experience. The high-payoff ATCCS user skills identified in this project, along with the BOS integration processes, provide a sound basis for tailoring digitally-focused training objectives/methods and performance assessment procedures. Such tailoring can enhance the ability of the observers to provide high-payoff feedback, reduce observers' workload, and boost the performance improvement realized by the unit.

A unified set of high-payoff ATCCS user skills and tasks serves equally well for brigade and battalion staffs. The same is true for critical staff functions, including BOS integration. At the same time, the echelon differences discussed earlier in this chapter are valuable for tailoring observation and feedback during ATCCS-focused training exercises. The findings suggest a practical means for focusing an observer's attention depending on whether the exercise occurs at the brigade or battalion level. For example, an S2 observer might zero in on integration of sensor data (e.g., UAV, JSTARS) at the brigade level, while concentrating on exploitation of the processed information at the battalion level.

AAR Implications

Though Army digitization has been ongoing for many years, AARs from digital exercises still focus on tactical execution without considering digital procedures. Numerous factors

contribute to this. First, applying digital tools to the mission at brigade and below is a relatively new concept, as is evaluation of digital competence. The Army's conversion of MTPs, SOPs and TSPs from analog to digital has been slow compared to ATCCS fielding. It is difficult to measure a unit's digital proficiency without measurement tools. Second, the spiral process of digitization has imposed serious challenges on tactical units (e.g., Johnston et al., 2002). Even more difficult than units retaining their proficiency through personnel turnover is finding observer/controllers or facilitators who are digitally savvy enough to provide quality feedback to the units. Third, one of the primary goals of digitizing the Army is to provide warfighters a COP, accelerating the decision process and making units more effective. Commanders are generally pleased when the outcome of a battle is a victory achieved by tactical proficiency. The AAR tends to focus on how well the unit fought or supported the fight, not how the employment of their digital tools contributed to their success. In the current research, the AARs observed by the team during digitally-oriented training events tended to focus on tactical feedback instead of digital feedback.

The ATCCS AAR feedback mechanisms are improving. For example, MCS-WS has the capability to take a snapshot of a COP overlay at any point in the battle. An OC can use this in the AAR to show favorable or unfavorable placement of Blue forces at critical times. The overlay snapshot could also be placed on a "whiteboard" via collaborative tools for the AAR. Another example of how ATCCS supports the review of unit performance is the Unit Track History function found in MCS-L. This function is based on the SA overlay and shows unit movement over a period of time.

The DOFT effort is the first attempt to provide observers of digital battle staff training proficiency measurement targets so there is a consistent standard of digital competence for the integrated staff. One of the primary goals is to provide evaluators with a measurement tool that might transcend their own digital expertise or lack thereof. The ATCCS-centered proficiency measurement tool, with its spotlight on digital processes and applications, will be presented in a companion report (Leibrecht et al., in preparation). The tool will provide detailed guidance for focusing AARs on digital feedback. In the meantime, Table 12 gives candidate AAR questions for digital staff training exercises. Appendix A also contains detailed questions that can help focus the battle staff on exploiting ATCCS capabilities.

Table 12

Useful Questions for Shifting the AAR Spotlight to ATCCS Exploitation

1. How did you use your digital tools to prepare, coordinate, and integrate planning products?
2. How did your section's use of ATCCS impact mission execution? Consider how digital information and collaborative tools affected your ability to execute actions.
3. What digital capabilities were especially helpful in performing your staff functions?
4. Given the exercise outcome, how would you change the way you used your ATCCS system?
5. Were there any advantages to planning with the aid of your MCS-L?
6. Did you use MCS-L whiteboard or chat capabilities in your mission rehearsal?
7. What lessons learned would you incorporate into your digital TOC SOP?

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The initial stage of the DOFT research project aimed to develop digital skills proficiency benchmarks for ATCCS-equipped battle staffs. The work pursued three principal goals: (a) examine major tactical performance dimensions of ATCCS utilization, including user skills; (b) characterize digital battle staff functions and processes; and (c) develop proficiency level criteria for major staff elements.

The information in this report originates from interviews and training observations obtained in the 1CD, the Army's second digitized division. The report sheds light on high-payoff ATCCS user skills and how these skills can enhance battle staff effectiveness. It also characterizes the progression of proficiency section-by-section. The findings help understand how battle staff elements can exploit their digital capabilities. The results highlight performance dimensions that can help leaders and trainers focus staff training on high-priority skills. The findings are of primary value where leaders, trainers, and evaluators are working to prepare realistically for ABCS-supported combat operations.

Forty-six ATCCS capabilities were identified as major contributors to battle staff effectiveness. The capabilities fall in six functional categories: digital basics, battlefield visualization, tactical information management and exchange, BOS-specific activities, mission planning and preparation, and mission execution.

Linked to mission essential tasks, ATCCS user skills and tasks support valid staff proficiency assessment and provide a basis for focusing training and feedback efforts. Four user skills emerged as high-payoff performance dimensions, encompassing 42 digital tasks:

1. Establish and Manage the COP
2. Manage Digital Information
3. Apply SU to Avoid Fratricidal Situations
4. Integrate Digital Battle Command Functions

As essential enablers of digital operations, network management skills contribute indispensably to digital proficiency of the battle staff. Three high-priority TI management skills apply to brigade and battalion S6 sections:

1. Verify Situational Awareness
2. Verify Command and Control
3. Verify Network Security

For the ATCCS-equipped battle staff, critical functions do not differ appreciably from those of the conventionally equipped staff. However, powerful ATCCS applications enable the staff to boost the speed, efficiency, and accuracy of combat-critical functions. In the process, new ways of doing business emerge, especially in the areas of battlefield visualization and staff collaboration. In the digital operations environment, nine critical staff functions stand out:

1. Ensure the commander's intent is disseminated and executed
2. Support the commander's decision making process

3. Promote situational understanding within and across echelons
4. Coordinate and synchronize combat activities of subordinate and supporting units
5. Acquire, process and share timely and accurate tactical information
6. Assess the effectiveness of combat actions in terms of the commander's intent
7. Facilitate flexibility of tactical operations (contingencies, targets of opportunity, etc.)
8. Preserve and sustain the combat power available to the commander
9. Anticipate and manage operational transition as mission requirements change

Integrating staff activities and products across BOSs poses special challenges in the digital environment, where advanced C4I capabilities await exploitation. To exploit the ATCCS applications, new technical skills as well as innovative processes become the order of the day. The following BOS integration processes can help focus staff proficiency targets:

1. Share/exchange information between BOSs
2. Actively interact, coordinate and collaborate across BOSs
3. Synchronize activities of related BOSs
4. Circulate staff planning products for review by other BOSs
5. Integrate separate BOS inputs into unified products
6. Plan and execute multi-BOS rehearsals

While critical functions and ATCCS user skills are basically the same for brigade and battalion staffs, the management and use of digital information differs between echelons. The brigade staff focuses on planning and setting the conditions for success, whereas the battalion staff concentrates on executing the mission. While the brigade staff filters and integrates data so they can push battlespace-specific information to the battalions, the battalion staff pulls information to prepare and synchronize the actions of companies and platoons. The brigade staff has special equipment (e.g., AMDWS, DTSS, UAV) to facilitate their data fusion and processing responsibilities.

Advanced C4I capabilities influence battle staff procedures, of course. Digitization compresses the military decision making process through accelerated collection, integration, analysis and sharing of tactical information. Digital tools enable innovative collaboration, concurrent development of staff products, instantaneous dissemination of information and products, and virtual wargaming—to mention a few key impacts. At the same time, selected functions (e.g., urgent warnings, clearance of fires) should continue to be accomplished by analog means. In some cases digital procedures depend on manual input, as in the entry of personnel rosters and UTO specifications. In case of system failures, digital battle staffs typically implement backup analog procedures.

Specialized SOPs for the digitally-equipped TOC are beginning to emerge among digital units. These documents describe digital activities in sufficient detail to shape expectations of digital skills performance. Complete and mature digital TOC SOPs are essential enablers of high-proficiency battle staffs. As a cornerstone for defining and standardizing digital proficiency expectations, the emerging digitally-focused SOPs can be expected eventually to influence digital TTP.

Derived from ATCCS user skills and tasks, proficiency level descriptors for key battle staff elements provide useful benchmarks for assessing how well an ATCCS-empowered staff is exploiting its digital capabilities. The low-to-high criteria point to progressive proficiency targets that can lead to highly competent digital staff sections. The proficiency level matrixes can be used diagnostically to help digital leaders identify training needs and shape training programs for the ATCCS-equipped staff. They can also help trainers and evaluators tailor measurement and feedback procedures to the needs of a specific staff.

Measuring the proficiency of an ATCCS-equipped battle staff is more complicated than for an FBCB2-equipped maneuver unit. This results from the greater diversity of C4I systems, sharing of systems among different staff elements, dispersion of CPs, greater complexity of the information environment, and other factors. Providing adequate coverage for staff performance assessment and feedback requires careful planning of observer staffing, C4I monitoring, and sources of data (both digital and analog).

The results of this research provide a knowledge base for tailoring digital staff training, developing tools to help staff leaders exploit ATCCS capabilities, and expanding ARI's emerging digital proficiency measurement architecture. The findings feed ongoing efforts to develop ATCCS exploitation guidelines, analyze measurement implications for the Future Force, and craft a comprehensive AAR architecture. A companion report (Leibrecht et al., in preparation) will document the remaining products and findings of the DOFT project.

Additional research is needed to expand the emerging digital proficiency architecture, extend the knowledge base to the future force, develop specialized measurement and feedback techniques and tools, and validate new or improved assessment methods and procedures.

Recommendations

This report has addressed the proficiency assessment dimensions of the ATCCS-equipped TOC environment. The findings are immediately useful to digital leaders, trainers and evaluators working to develop lethal battle staffs. The authors offer the following recommendations:

- Disseminate the findings of this report to digital brigades and battalions, to include those already digitized and those in transition.
- Advise tactical units how they can apply the ATCCS user skills and the BOS integration processes to focus their digital battle staff training programs.
- Provide guidance to digital staff leaders, trainers, and evaluators on how they can refocus AARs to emphasize exploitation of ATCCS capabilities.
- Incorporate the findings into the BCTC's training program, especially the Battle Staff Integration Course.
- Post key findings of this work in the BCTC's Digital Reference Center so warfighters can access the information via the Internet.
- Emphasize and resource the development and maintenance of digitally-focused SOPs as critical proficiency enablers.
- Establish a Web site where digital warfighters can easily submit their own insights and lessons learned for incorporation into the digital proficiency architecture.

The ongoing work of the DOFT project will establish guidelines for exploiting ATCCS capabilities, assess the impact of future C4I systems on staff proficiency measurement, and develop parameters for a comprehensive AAR system. In the near term, the digital proficiency architecture will boost the payoff of digital training programs. However, the transformation to the Future Force poses training issues and challenges that have yet to surface. By defining the problems of the future and creating innovative solutions, forward looking research will play a key role in establishing training as a prime combat multiplier in the future operational environment.

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APPENDIX A

Data Collection Instruments

Interview Questions for Each Target Group

Brigade/Battalion Commander

1. How do you direct a COP? What digital guidance do you provide your staff?

2. Do digital rehearsals occur in your Bde/Bn? If so, how often do you do them? What integration tasks (e.g., digital systems that "feed" each other) do you cover during the rehearsal? (this can be brought out during an analog rehearsal, too)

3. What battle staff integration methods (especially digital) should be employed that may not be currently considered?

4. What digital capabilities contribute most to successful staff operations? (Consider MCS, ASAS, AFATDS, AMDWS, and FBCB2.)

5. Do you direct which staff section is responsible for digital information management in order to avoid duplication of effort and information? (e.g., Who reports when CCIR/FFIR occur?)

6. What digital criteria do you set prior to LD? (i.e., Certain % of FBCB2 up, when/where UAV placement will likely occur, who is allowed to delete red icons? Who is allowed to submit CFF, or decide filter settings METT-TC dependent?)

7. What digital operations do we not do so well that could be improved upon in future digital TOCs?

8. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

9. What are the 3 biggest differences between analog battle command processes and digital battle command processes?

10. What are the 3 biggest battle staff integration problems you've encountered in this unit? How do MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

11. What are the main deficiencies of the current AAR system that supports your training? How would you improve it?

Brigade/Battalion Executive Officer (XO)

1. How do you direct a COP? What digital guidance do you provide your staff? How do you manage it throughout the mission?

2. What digital tools do you use during MDMP?

3. Has your staff ever performed a digital mission rehearsal? If not, why?

4. What digital tools do you incorporate into risk management?

5. How do you monitor fratricide prevention? What digital tools do you use to avoid fratricide?

6. Who monitors CCIR/FFIR? How do they do it?

7. How do you integrate the TOC so systems don't stand alone but work together to contribute to mission success?

8. What is the most critical digital action(s) that you perform as related to TOC integration?

9. What digital capabilities contribute most to successful staff operations? (Consider MCS, ASAS, AFATDS, AMDWS, and FBCB2.)

10. What digital PCCs have you incorporated into your TOC?

11. What are the 3 biggest battle staff integration problems you've encountered in this unit? How do MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

12. What are the 3 biggest differences between analog battle command processes and digital battle command processes?

13. What are the main deficiencies of the current AAR system that supports your training? How would you improve it?

14. What digital operations do we not do so well that could be improved upon in future digital TOCs?

15. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

Brigade/Battalion Operations Officer (S3)

1. What systems do you receive information from in the TOC? How do you manage that information? What does your TACSOP dictate?

2. How do you integrate various command posts (e.g., command group, TAC CP, Main CP, Rear CP)?

3. How do you perform battle tracking with digital tools?

4. What digital tools do you use (and how) to monitor A2C2?

5. Describe digital application or monitoring of the Deep, Close and Rear fight?

6. How might you apply digital tools in a SASO environment?

7. How could you better integrate the TOC so information was streamlined, managed faster, and deconflicted?

8. What digital tools do you use in developing and monitoring your ISR plan?

9. What tools do you use to ensure the UTO was executed and the majority of platforms received it?

10. What digital tools do you use to analyze AO, AI, and AOI?

11. How do you perform terrain management?

12. What digital systems do you apply in determining priority of fires?

13. How do you integrate fire support?

14. What TTPs do you follow when going through the MDMP?

15. How do you use digital tools to conduct parallel and collaborative planning?

16. What is the most critical digital action(s) that your section performs as related to TOC integration?

17. What digital PCCs have you incorporated into your section?

18. What are the 3 biggest battle staff integration problems you've encountered in this unit? How do MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

19. What are the 3 biggest differences between analog battle command processes and digital battle command processes?

20. What are the main deficiencies of the current AAR system that supports your training? How would you improve it?

21. What digital operations do we not do so well that could be improved upon in future digital TOCs?

22. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

23. What digital planning products do you prepare or process using digital tools? What problems occur as you do this?

24. Given that digitization provides the capability to speed up the planning process and disseminate plans more quickly, do you get feedback from other BOSs in time to make changes?

25. If you saw a problem with a plan in terms of information gaps, what would you do?

26. Do you look at digital planning products to see if there have been any changes? If so, which ones?

27. How do you know when digital planning products are available for the first time and when they have been updated?

28. Do you have trouble tracking changes in the various plans and overlays? How do you resolve this?

29. How does your unit or section manage the naming and filing of digital orders and overlays? Is there a unit SOP governing this?

30. Have you had any problems keeping track of SA data throughout the mission planning, preparation and execution process? If so, what problems? How did you know how to solve the problems?

Brigade/Battalion Intelligence Officer (S2)

1. What digital tools do you apply to conduct battletracking?
2. What digital information do you apply when conducting IPB?
3. What digital systems do you apply in determining the priority of fires?
4. What digital tools do you use in creating the modified combined obstacle overlay?
5. What TTPs does your section go through when setting up the TOC?
6. How do you provide input to CCIR status?
7. What digital systems provide input into the correlated Red picture? What TTPs have you incorporated to ensure the Red picture is accurate and disseminated in a timely manner? Are those TTPs in your TACSOP?
8. What is the most critical digital action(s) that your section performs as related to TOC integration?
9. What digital PCCs have you incorporated into your section?
10. What are the 3 biggest battle staff integration problems you've encountered in this unit? How do MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?
11. What are the 3 biggest differences between analog battle command processes and digital battle command processes?
12. What are the main deficiencies of the current AAR system that supports your training? How would you improve it?
13. What digital operations do we not do so well that could be improved upon in future digital TOCs?
14. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

Brigade/Battalion Personnel Officer (S1)

1. How do you conduct a digital mission analysis?

2. What digital interface do you depend on in order to conduct logistics preparation of the battlefield (LPB)? (Cover CHS plan, mission analysis, SJA, PAO, religious)

3. What digital TTPs has your section incorporated? Are they in your TACSOP?

4. What TTPs do you apply in casualty reporting?

5. How does your section ensure they are operating on the same COP as higher headquarters?

6. How does your section conduct battletracking?

7. What TTPs do you incorporate in the receipt and processing of the PERSTAT?

8. What digital systems or staff sections provide input into your concept of support? (Eng, FSO, S1-S6)

9. What is the most critical digital action(s) that your section performs as related to TOC/ALOC integration?

10. What digital PCCs have you incorporated into your section?

11. What are the 3 biggest battle staff integration problems you've encountered in this unit? How do CSSCS, MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

12. What are the 3 biggest differences between analog battle command processes and digital battle command processes?

13. What are the main deficiencies of the current AAR system that supports your training? How would you improve it?

14. What digital operations do we not do so well that could be improved upon in future digital TOCs?

15. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

Brigade/Battalion Logistics Officer (S4)

1. What digital tools do you integrate in the conduct of MDMP? Is your method incorporated into your TACSOP?

2. Does your section conduct or participate in digital rehearsals? If not why?

3. What digital interface do you depend on in order to conduct LPB? (route recon, mission analysis, concept of support with FSB)

4. What TTPs do you incorporate in the receipt and processing of the LOGSTAT?

5. What digital systems or staff sections provide input into your concept of support? (Eng, FSO, S1-S6)

6. What digital TTPs do you incorporate in monitoring the maintenance and supply status of your unit?

7. What is the most critical digital action(s) that your section performs as related to TOC/ALOC integration?

8. What digital PCCs have you incorporated into your section?

9. What are the 3 biggest battle staff integration problems you've encountered in this unit? How do CSSCS, MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

10. What are the 3 biggest differences between analog battle command processes and digital battle command processes?

11. What are the main deficiencies of the current AAR system that supports your training? How would you improve it?

12. What digital operations do we not do so well that could be improved in future TOCs?

13. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

14. How do you know when digital planning products are available for the first time and when they have been updated?

15. Do you have trouble tracking changes in the various plans and overlays? How do you resolve this?

16. How does your unit or section manage the naming and filing of digital orders and overlays? Is there a unit SOP governing this?

17. Have you had any problems keeping track of SA data throughout the mission planning, preparation and execution process? If so, what problems? How did you know how to solve the problems?

Brigade Civil Affairs Officer (S5)

1. What digital tools are imperative in the creation of CMO plans and the monitoring of operations?

2. How do you digitally integrate civil affairs into the targeting, IR and ISR process?

3. How do you ensure you have a COP?

4. What other staff sections do you interact with digitally and why?

5. Have you established digital TTPs for your section? What are they and are they in the TACSOP?

6. What is the most critical digital action(s) that your section performs as related to TOC integration?

7. What digital PCCs have you incorporated into your section?

8. What digital operations do we not do so well that could be improved upon in future digital TOCs?

9. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

Brigade/Battalion Signal Officer (S6)

1. What digital TTPs have you established in the operation of your section?
2. What is the most critical digital action(s) that your section performs as related to TOC integration?
3. What C4ISR issues do you monitor closely?
4. What terrain analysis tools do you use in recommending CP locations?
5. What digital systems do you interface with?
6. How do you monitor and track digital nodes in the Bde/Bn?
7. How do you monitor MDL loads for your Bde/Bn?
8. What digital PCCs have you incorporated into your section?
9. What are the 3 biggest system integration problems you've encountered in this unit? (Consider CSSCS, MCS, ASAS, AFATDS, AMDWS, and FBCB2.)
10. What digital operations do we not do so well that could be improved upon in future digital TOCs?
11. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?
12. How do you initialize your TACLAN? How do you shut the TACLAN down?
13. How does the TOC resolve unexpected TACLAN "outages"?

Engineer

1. What digital PCCs have you incorporated into your section?

2. What digital operations do we not do so well that could be improved upon in future digital TOCs?

3. What would you change to make digital TOCs of the future run more efficiently and contribute more to the mission?

4. How could your Bde/Bn better use the digital resources you provide?

5. What digital tool or systems do you use in going through the MDMP?

6. How do you use digital systems when you are conducting engineer reconnaissance or engineer ops?

7. How do you ensure you have a COP?

8. What digital tools do you use in coordinating Class IV/V with the S4?

9. What are the 3 biggest information management problems you've encountered in this unit?

10. What are the 3 biggest coordination problems you've encountered in digital operations? How do MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

11. What digital planning products do you prepare or process using digital tools? What problems occur as you do this?

12. Have you had any problems keeping track of SA data throughout the mission planning, preparation and execution process? If so, what problems? How did you know how to solve the problems?

Fire Support Officer (FSO)

1. What digital PCCs have you incorporated into your section?

2. What digital tools do you integrate in planning for fire support?

3. Have you participated in a digital rehearsal? If no, why?

4. What digital operations do we not do so well that could be improved upon in future digital TOCs?

5. What could we change to make digital TOCs of the future run more efficiently and contribute more to the mission?

6. What digital tools do you use in BDA assessment? How do you integrate this information with the TOC?

7. What are the 3 biggest information management problems you've encountered in this unit?

8. What are the 3 biggest coordination problems you've encountered in digital operations? How do MCS, ASAS, AFATDS, AMDWS, and FBCB2 help or hinder those problems?

9. What digital planning products do you prepare or process using digital tools? What problems occur as you do this?

10. How does your unit or section manage the naming and filing of digital orders and overlays? Is there a unit SOP governing this?

11. Have you had any problems keeping track of SA data throughout the mission planning, preparation and execution process? If so, what problems? How did you know how to solve the problems?

Observation Guide

Areas for observers to gather data concerning digital TOC and BOS integration issues:

Digitization Impacts

1. How did the unit use or apply digital systems to make significant contributions to the execution of the mission in terms of information presented or in terms of the ability to help implement actions?

2. Did you observe any payoffs to planning in a digital mode?

Synchronizing Evolving Plans

3. Note when each BOS first sees planning products from other BOSs. In what format are the products presented? Is there a difference between the time when products are available to be reviewed and the time they are actually reviewed?

4. Did any BOS provide feedback or input to another BOS regarding synchronization issues?

5. Was there any observed confusion regarding the identity of the most current versions of planning products (confusion within or among BOSs)?

6. How is the status of the planning process, including time, monitored?

Digital Rehearsals

7. Which digital systems are involved in rehearsals? What did system operators do during these rehearsals? What action items relevant to the use of digital systems resulted from these rehearsals?

8. Are communication links checked during rehearsals? Are trigger events involving digital displays checked?

Monitoring the Situation

9. Who is responsible for keeping track of the status of PIRs?

10. Are systems operators assigned certain digital functions or information to focus on during mission execution?

11. Do digital operators have a specific set of events they are expected to track for almost any exercise, or do the events vary for specific types of missions?

12. What BOSs use digital friendly SA data, how is it used, and what is the source of the SA data (FBCB2? MCS? etc.)?

BOS Integration During Execution

13. Are there operator-to-operator voice communications? What are examples of the topics covered?

14. What situations were observed that caused operators to communicate with another BOS?

15. When do the various BOSs communicate with other BOSs and how do they communicate?

Use of Terrain Analysis Tools

16. What kinds of questions are being answered with terrain analysis tools?

17. Who uses terrain analysis tools to support planning? Who uses terrain analysis tools to support execution? How do they use the tools?

Network

18. Are periodic checks of connectivity made within the TOC or among TOCs at various echelons? If so, what checks are made and what triggers these checks?

19. What do digital operators and information integrators do to prepare for the possibility of system or network crashes?

20. If there are any system or network crashes, what do the operators and information integrators do to respond to the situation?

21. What information does Brigade track regarding FBCB2 connectivity rates? Regarding connectivity within the TOC? Regarding connectivity with TOCs at higher, adjacent and lower echelons?

22. Are operators aware of actions that can lead to system crashes?

APPENDIX B

Digital Proficiency Level Matrixes for Battle Staff Sections

Digital Proficiency Levels

S3-Plans Section (Brigade and Battalion)

Parameter	Staff Proficiency Levels		
	Low	**Medium**	**High**
Creation of Products	Create majority of products by analog means, stagger production	Create majority of products concurrently using less efficient digital tools	Create all products collaboratively and concurrently using most efficient digital tools
BOS Integration	Coordinate sporadically across BOSs using analog means, integrate products near end of planning or not at all	Share information across BOSs using less efficient digital means, integrate products late in planning	Conduct seamless BOS integration using digital collaborative tools, integrate products continuously
Updating of Products	Update OPORD and overlays rarely, without awareness of higher HQ digital updates	Obtain higher HQ digital updates sporadically, update OPORD and overlays digitally without integrating them	Obtain higher HQ digital updates promptly, integrate them into OPORD and overlays routinely by using most efficient digital tools
Staff Planning Process	Use analog means to conduct planning without integrating input from other staff sections; ignore management of 1/3 2/3 rule; complete most products late	Use digital and analog tools to conduct planning, integrating input from other staff sections; manage 1/3 2/3 rule; complete most products on time	Use digital tools to expedite continuous, fully integrated planning; significantly reduce planning time; complete most products early
Distribution of Products	Distribute order and overlays via physical means, seriously delaying Co/Plt planning/prep	Distribute order and overlays via MCS down to Bn TOC; staged process moderately delays Co/Plt planning/prep	Distribute order and overlays via MCS (down to Bn) and MDL (down to Plt); rapid process enables Co/Plts to start planning/prep early; post backups on web page

Digital Proficiency Levels

S3-Operations Section (Brigade and Battalion)

Parameter	Staff Proficiency Levels		
	Low	**Medium**	**High**
Management of Common Operational Picture (COP)	Obtain COP overlays by analog and digital means, display incomplete COP on CIC, update occasionally	Obtain COP overlays by digital means, display nearly complete COP on CIC, update frequently	Obtain and deconflict overlays digitally, tailor COP IAW Cdr's guidance and METT-TC, display complete COP on CIC, update continuously
Creation/ Updating of Products	Create selected products digitally, stagger production, update rarely	Create majority of products concurrently using less efficient digital tools, update sporadically	Create all products concurrently using digital collaborative tools, update routinely
Management of Information	Manage flow and fusion of ATCCS information using analog procedures, without awareness of digitally unique aspects	Establish digital TOC SOP; use simpler standardized digital procedures such as filter settings, file/folder naming conventions, and overlay colors; direct fusion of digital data reactively	Establish, apply and enforce digital TOC SOP; designate ATCCS filter settings, standardize naming conventions and overlay colors, create chart tabs, recall map areas, leverage shared folders, exploit collaborative tools and JVMF messaging; direct fusion of digital data proactively
Distribution of Products	Distribute overlays via analog or physical means, with significant delays	Distribute majority of overlays by posting on web page, with minor delays; notify recipients sporadically	Routinely transfer overlays digitally without delay, post backups on web page, disseminate via MCS or MDL; notify recipients expeditiously
Battle Tracking Process	Update COP occasionally using analog procedures, track CCIR via analog means, coordinate across BOSs via voice, update subordinate TOCs/CPs sporadically by voice	Record significant events using MCS-L Staff Journal, update COP frequently using analog and digital means, track CCIR via analog means, coordinate across BOSs via voice, update subordinate TOCs/CPs occasionally by digital and analog means	Track significant events using MCS-L Staff Journal, update COP routinely by digital means, track and display CCIR digitally, coordinate across BOSs via most efficient digital/analog means, update subordinate TOCs/CPs by digital means IAW battle rhythm

Digital Proficiency Levels

S2 Section (Brigade and Battalion)

Parameter	Staff Proficiency Levels		
	Low	**Medium**	**High**
Intelligence Planning Process	Create ASAS templates, obtain data mainly from non-digital sources, share information rarely across BOSs	Create and update ASAS templates, obtain data from selected support systems, share information intermittently across BOSs	Tailor and maintain ASAS templates, obtain data from all support systems (JSTARS*, UAV*, Radar, Guardrail*, FBCB2, HUMINT), share information routinely by plotting on digital map
Management of Red Picture	Create Red picture on ASAS using limited Intel sources, disseminate updates occasionally	Tailor Red picture on ASAS using selective Intel sources, query JCDB by time, disseminate updates frequently	Exploit ASAS to filter and fuse enemy data from all Intel sources, query JCDB by organization-echelon-time, rapidly disseminate updates
Weather Monitoring	Obtain IMETS data rarely, without awareness of higher HQ digital updates	Obtain IMETS data sporadically, update products piecemeal	Obtain IMETS data promptly, update products with integrated information
Creation/ Updating of Products	Create correlated Red feed and PIRs digitally, stagger preparation, update rarely	Create majority of products concurrently using less efficient digital tools, update sporadically	Create all products using digital collaborative tools, update routinely
Targeting Process	Identify targets using ASAS, coordinate across BOSs via analog means, update information rarely	Assess targets using ASAS, coordinate across BOSs using less efficient digital tools, update information occasionally	Evaluate targets using ASAS, coordinate across BOSs using digital collaborative tools, update information continuously
Distribution of Products	Distribute Red picture, weather forecasts, etc. via analog means, with significant delays	Distribute majority of products digitally, with minor delays; notify recipients sporadically	Routinely disseminate products digitally with no delay; notify recipients expeditiously; post backups on web page

* System is available at brigade echelon only

Digital Proficiency Levels

Fire Support Element (Brigade and Battalion)

Parameter	Staff Proficiency Levels		
	Low	**Medium**	**High**
Management of Fire Support Picture	With supervision create FS overlay using AFATDS, disseminate across selected BOSs, update occasionally	Create FS overlay using AFATDS, disseminate across all BOSs, update frequently	Create FS overlay using AFATDS, rapidly integrate and disseminate across BOSs, update continuously
Creation/ Updating of Products	With supervision create selected products digitally, stagger production, update rarely	Create majority of products concurrently using less efficient digital tools, update sporadically	Create products using digital collaborative tools, update routinely; know which products should remain analog
Development of Attack Guidance	With supervision create or modify digital Attack Guidance Matrix (AGM) using non-ATCCS means, integrate in FS Annex by analog means; disseminate to S3 by physical means	Create/modify and coordinate digital AGM using less efficient AFATDS tools, integrate in FS Annex by digital means; disseminate to S3 by digital means	Collaborate digitally with targeting team to create/ modify digital AGM, integrate digitally into FS Annex, disseminate to S3 by most efficient digital means
Distribution of Products	Distribute matrixes via analog or physical means, with significant delays	Distribute majority of matrixes digitally, with minor delays; notify recipients sporadically	Routinely distribute matrixes digitally without delay; notify recipients expeditiously; post backups on web page
Battle Damage Assessment (BDA)	Receive BDA data by analog means, provide input to S2 by analog means	Receive BDA data by analog means, input into AFATDS, provide input to S2 digitally	Receive BDA data digitally, using AFATDS template with automatic forwarding of info to S2

Digital Proficiency Levels

Air Defense Artillery Section (Brigade)

Parameter	Staff Proficiency Levels		
	Low	**Medium**	**High**
Creation/ Updating of Products	Create selected products digitally, stagger production, update rarely	Create majority of products concurrently using less efficient digital tools, update sporadically without integrating across BOSs	Create all products (OPORD Annex, overlays) using most efficient digital tools, update routinely with integration across BOSs
Dissemination of Airspace Defense Overlay	Obtain higher HQ airspace coordination overlay by analog and digital means, disseminate overlay by analog means, update COP airspace picture rarely	Obtain higher HQ airspace coordination overlay digitally, disseminate overlay by analog and digital means, update COP airspace picture sporadically	Obtain higher HQ airspace coordination overlay digitally, integrate across BOSs; disseminate to AFATDS, MCS, ASAS and CSSCS by digital means; digitally update COP airspace picture routinely
Planning and Tracking of Air Defense Coverage	Utilize Air Defense Launcher and Planner, track ADA assets and plot AD weapons deployment by analog means, use LOS tool sporadically	Utilize Air Defense Launcher and Planner, track ADA assets and plot AD weapons deployment by analog and digital means, use LOS tool frequently	Utilize Air Defense Launcher and Planner, track ADA assets and plot AD weapons deployment by analog and digital means, verify ADA coverage using SA, use LOS tool routinely
Distribution of Products	Distribute AD overlay via analog or physical means, with significant delays	Distribute majority of products digitally, with minor delays; notify recipients sporadically	Routinely distribute products digitally without delay; notify recipients expeditiously; post backups on web page
FAADC3I Utilization	Rarely establish AMDWS-FAADC3I connectivity (thereby missing live tracks in airspace picture), use analog means to broadcast early warning (EW)	Usually establish connectivity with FAADC3I, sporadically display live tracks in airspace picture, use analog means and FAADC3I to broadcast EW	Continuously maintain connectivity with FAADC3I, routinely display live tracks in airspace picture, use FAADC3I to broadcast EW

Digital Proficiency Levels

ALOC/CTCP (Brigade and Battalion)

Parameter	Staff Proficiency Levels		
	Low	**Medium**	**High**
Preparation of Logistics Overlay	Create CSS overlay using CSSCS, disseminate digitally across selected BOSs, update occasionally	Create CSS overlay using MCS-L, disseminate digitally across all BOSs, update frequently	Tailor CSS overlay using MCS-L, disseminate by most efficient digital means across all BOSs, update promptly as changes in METT-TC occur
Management of Cdr's Tracked Items List (CTIL)	Create/tailor CTIL from BRIL in CSSCS, track status both manually and digitally, coordinate down to company by analog means	Create/tailor CTIL from BRIL in CSSCS, track status digitally, coordinate down to company by digital means	Create/tailor CTIL from BRIL in CSSCS, track status digitally, interface with STAMIS, coordinate across BOSs
Monitoring of Logistics Status	Query CSSCS for selected reports, coordinate via analog means, update information rarely	Query CSSCS for mission essential reports (Class III bulk, V, VII, maintenance, and personnel), coordinate via digital and analog means, update information sporadically	Query CSSCS for all available reports (Class III bulk & packaged, IV, V, VII, VIII, IX, maintenance, personnel, etc.), coordinate via digital means, update information routinely
Distribution of Reports	Distribute logistics reports via analog or physical means, with significant delays	Distribute logistics reports digitally, with minor delays; notify recipients sporadically	Routinely distribute logistics reports digitally, without delay; notify recipients expeditiously
Personnel Management Process	Receive PERSTAT via digital and analog means, manually update CSSCS, sporadically input into SIDPERS	Receive PERSTAT via digital means, routinely input into SIDPERS	Receive PERSTAT digitally, promptly track and manage personnel status by digital means

APPENDIX C

List of Acronyms and Abbreviations

1CD	1st Cavalry Division
3D	3-Dimensional
4ID	4th Infantry Division
A2C2	Army Airspace Command and Control
AAR	After Action Review
ABCS	Army Battle Command System
ACT	Analysis and Control Team
AD	Air Defense
ADA	Air Defense Artillery
AFATDS	Advanced Field Artillery Tactical Data System
AGM	Attack Guidance Matrix
AI	Area of Interest
ALOC	Administrative/Logistics Operations Center
AMDWS	Air and Missile Defense Workstation
AO	Area of Operations
ARI	U. S. Army Research Institute for the Behavioral and Social Sciences
ASAS	All Source Analysis System
ASAS-L	All Source Analysis System-Light
ASAS-RWS	All Source Analysis System-Remote Workstation
ATCCS	Army Tactical Command and Control System
BCT	Brigade Combat Team
BCTC	Battle Command Training Center
BDA	Battle Damage Assessment
Bde	Brigade
BFA	Battlefield Functional Area
BLUFOR	Blue Forces
Bn	Battalion
BOS	Battlefield Operating System
BRIL	Baseline Resource Items List
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CCIR	Commander's Critical Information Requirement
CFF	Call for Fire
CGS	Common Ground Station
CIC	Command Information Center
CLOS	Circular Line of Sight
CMO	Civil-Military Operations
Co	Company
COP	Common Operational Picture
CP	Command Post

CSMA	Carrier Sense Multiple Access [Server]
CSS	Combat Service Support
CSSCS	Combat Service Support Control System
CTC	Combat Training Center
CTCP	Combat Trains Command Post
CTIL	Commander's Tracked Items List
CTP	Common Tactical Picture [Software]
DOFT	Digital Operations Feedback Tools [Project]
DP	Decision Point
DTSS	Digital Topographic Support System
Eng	Engineer
EPLRS	Enhanced Position Location Reporting System
EW	Early Warning
FAADC3I	Forward Area Air Defense Command, Control, Communications and Intelligence [System]
FBCB2	Force XXI Battle Command Brigade and Below
FFIR	Friendly Forces Information Requirement
FM	Frequency Modulation [Radio]
FRAGO	Fragmentary Order
FS	Fire Support
FSCM	Fire Support Control Measure
FSO	Fire Support Officer
HQ	Headquarters
HUMINT	Human Intelligence
IAW	In Accordance With
IMETS	Integrated Meteorological System
IPB	Intelligence Preparation of the Battlefield
ISR	Intelligence, Surveillance and Reconnaissance
JCDB	Joint Common Database
JSTARS	Joint Surveillance Target Attack Radar System
JVMF	Joint Variable Message Format
LAN	Local Area Network
LD	Line of Departure
LNO	Liaison Officer
LOGSTAT	Logistics Status [Report]
LOS	Line of Sight
LPB	Logistics Preparation of the Battlefield
MCS	Maneuver Control System
MCS-L	Maneuver Control System-Light
MCS-WS	Maneuver Control System Workstation
MDL	Mission Data Loader
MDMP	Military Decision Making Process
METT-TC	Mission, Enemy, Terrain, Troops, Time, and Civilian Considerations
MSE	Mobile Subscriber Equipment
MSTF	Mission Support Training Facility
MTP	Mission Training Plan

NBC	Nuclear, Biological, Chemical
NCO	Non-Commissioned Officer
NFZ	No Fire Zone
NG	National Guard
NTDR	Near Term Digital Radio
OC	Observer/Controller
OPORD	Operation Order
PAO	Public Affairs Officer
PCC	Pre-Combat Checks
PERSITREP	Personnel Situation Report
PERSTAT	Personnel Status [Report]
PIR	Priority Intelligence Requirement
Plt	Platoon
RWS	Remote Workstation
SA	Situational Awareness
SASO	Stability and Support Operations
SBCT	Stryker Brigade Combat Team
SIDPERS	Standard Installation/Division Personnel System
SJA	Staff Judge Advocate
SME	Subject Matter Expert
SOP	Standing Operating Procedure
SSRU	Simulator Systems Research Unit
STAMIS	Standard Army Management Information System
SU	Situational Understanding
TAC	Tactical Command Post
TACLAN	Tactical Local Area Network
TACSOP	Tactical SOP
TI	Tactical Internet
TIMS	Tactical Internet Management Software
TOC	Tactical Operations Center
TRADOC	U.S. Army Training and Doctrine Command
TSP	Training Support Package
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicle
UTO	Unit Task Organization
UTR	Unit Task Reorganization
WARNO	Warning Order
WIN-T	Warfighter Information Network-Tactical
WS	Workstation